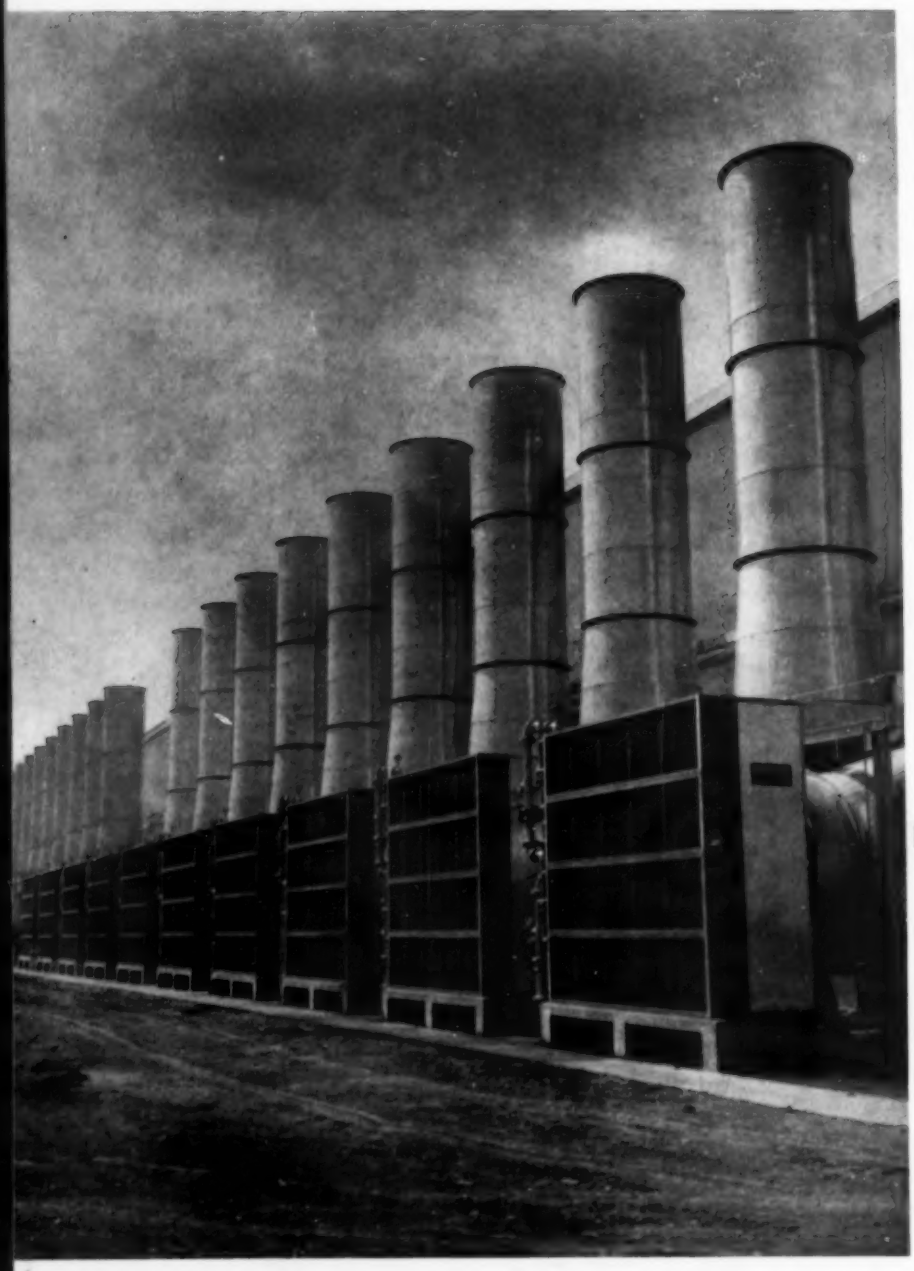
Industry and Power



February 1955

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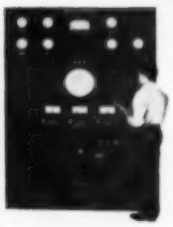
Save Blowdown Btu's — Page 44

for the man considering a PACKAGE BOILER

new all-electric METERING TYPE PACKAGED CONTROL by HAYS



Now available for *all* makes and sizes of water tube type package boilers is the new all-electric, metering type Hays packaged control.

Metering type control provides maximum combustion efficiency regardless of the fuel burned because it *actually meters* the fuel flow and air flow, and automatically maintains the desired ratio. No adjustments are needed when changing fuels or oil burner tips.

All-electric operation includes not only safety devices but also steam, fuel, and air controllers and valves—uses only the normal source of AC voltage. No compressed air is required.

Fully automatic, safe and reliable operation is assured because Hays maintains the same industrial quality built into the largest utility combustion control system and it is factory tested before shipment.

Complete package in one simple and inexpensive to install panel board.

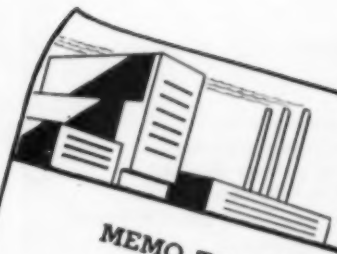
Write today for fact-filled Bulletin 53-1088-239.

THE **hays** CORPORATION

MICHIGAN CITY 2, INDIANA

Automatic Combustion Control • Veriflow Meters and Veritrol • Electronic Oxygen Recorders • CO_2 Recorders Boiler Panels • Gas Analyzers • Combustion Test Sets Draft Gages • Electronic Flowmeters • Miniature Remote Indicators • Electronic Feed Water Controls

Circle 500 on Reply Card for more data



DON'T TALK—WRITE

MEMO TO: My Secretary
SUBJECT: Springfield Stoker-fired Package Boilers

Write Springfield Boiler Co. for drawings and other details on their new stoker-fired, first stage forced circulation High Temperature-High Pressure, shop assembled Hot Water Package Boilers!

Also ask for similar details on Springfield's oil and gas fired hot water generators.

Notes for the file: These Springfield water-tube HT-HP Hot Water Generators range in capacity from 6,000,000 to 39,000,000 Btu/hr and may be obtained in design pressures up to 900 psig. They are similar in design to Springfield's Package Steam Generators.

In addition to HT-HP hot water, Springfield's Hot Water Generators will also deliver a limited amount of saturated steam at the same time.

J.D.D.

All management executives, plant, development and consulting engineers, and purchasing agents should have this information. Be sure and write today for details on Springfield coal-fired package generators!

SPRINGFIELD BOILER CO.

FOUNDED IN 1890
DIVISION OF John W. Hobbs Corporation
1967 EAST CAPITOL AVENUE SPRINGFIELD, ILLINOIS

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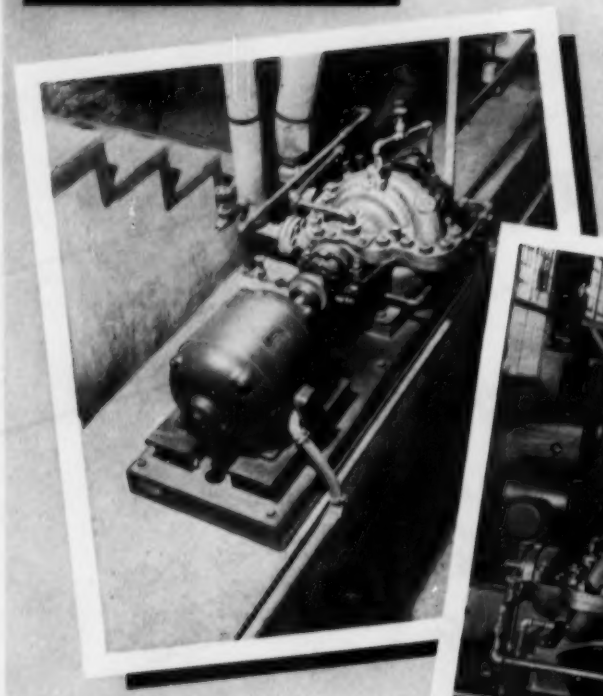
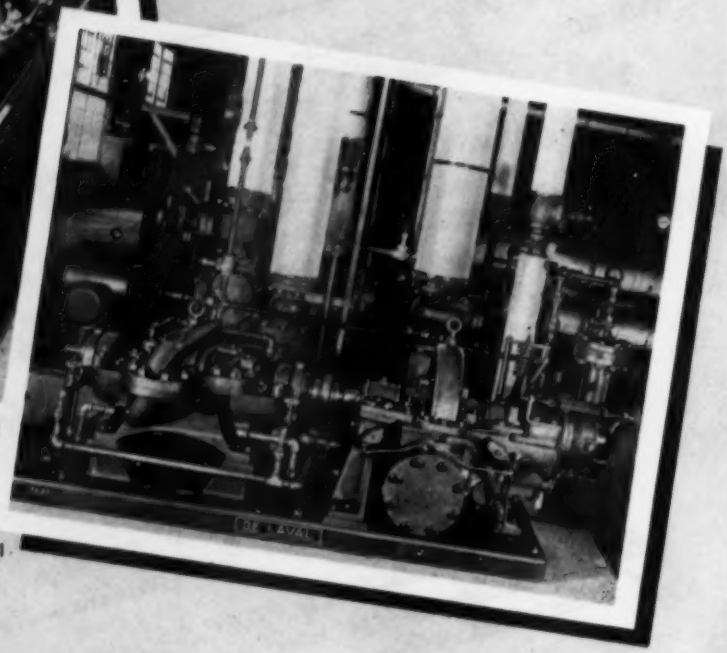
DE LAVAL
TWO-STAGE HORIZONTAL PUMPS

for dependable boiler feed service in institutions . . . industrial plants



Institutions can't afford shutdowns. In this hospital installation a motor-driven 21S boiler feed pump provides year-in, year-out dependability. It delivers 70 gpm of 240° water at 420 ft. head.



Industrial plants, too, choose reliable De Laval pumps for boiler feed service. This De Laval unit, driven by a De Laval turbine, delivers 160 gpm of 215° water at 520 ft. head.

There are good reasons why De Laval 21S-2KS two-stage horizontal split case pumps give long, economical boiler feed service. They are designed with • back-to-back impellers for balanced hydraulic thrust • easily replaceable threaded impeller wearing rings • long life labyrinth case rings • ring oiled ball bearings — plus ten other important design features.

These De Laval pumps are available in sizes from 2" to 8" discharge, for capacities from 75 to 3,000 gpm and heads to 750 ft.

Write for Bulletin 1501 giving complete data.

DE LAVAL *Boiler Feed Pumps*

DE LAVAL STEAM TURBINE COMPANY

857 Nottingham Way, Trenton 2, New Jersey

DL 874

Circle 502 on Reply Card for more data

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Industry and Power

Volume 68 **February 1955** Number 2

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acorns

. . . recently announced . . . worth watching

Taking Another Look

Zirconium, beryllium and titanium are not the only exciting new metals, according to a report in *Steel Ways*, a publication of the American Iron & Steel Institute. They report that molybdenum, long familiar as an alloying metal for steel, is now the subject of experiments as a base metal. It shows great promise as a high temperature metal for jet engines and other extreme temperature applications. Rapid oxidation is its chief drawback, but if a protective coating can be developed, it may become a crucial metal for very high temperature use. Other alloying elements such as tungsten and vanadium are also under study as possible base metals, but results either are inconclusive or hidden behind security regulations.

New Silicone Lubricant

A new silicone lubricant with outstanding thermal and load bearing properties is being tested by Materials and Aviation Gas Turbine engineers of Westinghouse. The silicone fluid has satisfactorily passed thermal stability and viscometric tests at temperatures ranging from 65 F to 500 F. Steel-to-steel bearing test loads have shown the fluid to have excellent lubricating qualities up to 107,000 lb per sq in. bearing area.

Water Analysis

A new light-scattering instrument called a microphotometer is being used at the Hanford atomic energy plant to measure water turbidity. The instrument makes use of a photocell - amplifier - galvanometer circuit to measure the amount of light scattered when a beam is directed at a water sample. The use of these instruments is being considered in place of chemical analyses currently being used for water quality control. It is believed that their use will cut cost of testing significantly.

Electric Motor Lubricant

A specification for the ideal general-purpose electric-motor grease has been determined after six years of investigation. Its consistency values were chosen in the grade-2 range so that the grease maintains its structure but is soft enough to lubricate.

Vibration Measurement

Word comes from General Electric that the magnitude of vibration displacement of low-speed multi-bearing equipment can be detected and recorded with a new vibration recorder. If the monitored displacement exceeds a preset level, the instrument activates an alarm or shuts down the equipment. From 1 to 18 velocity-type vibration detectors can be attached to the monitored machinery.

New Wood Laminate

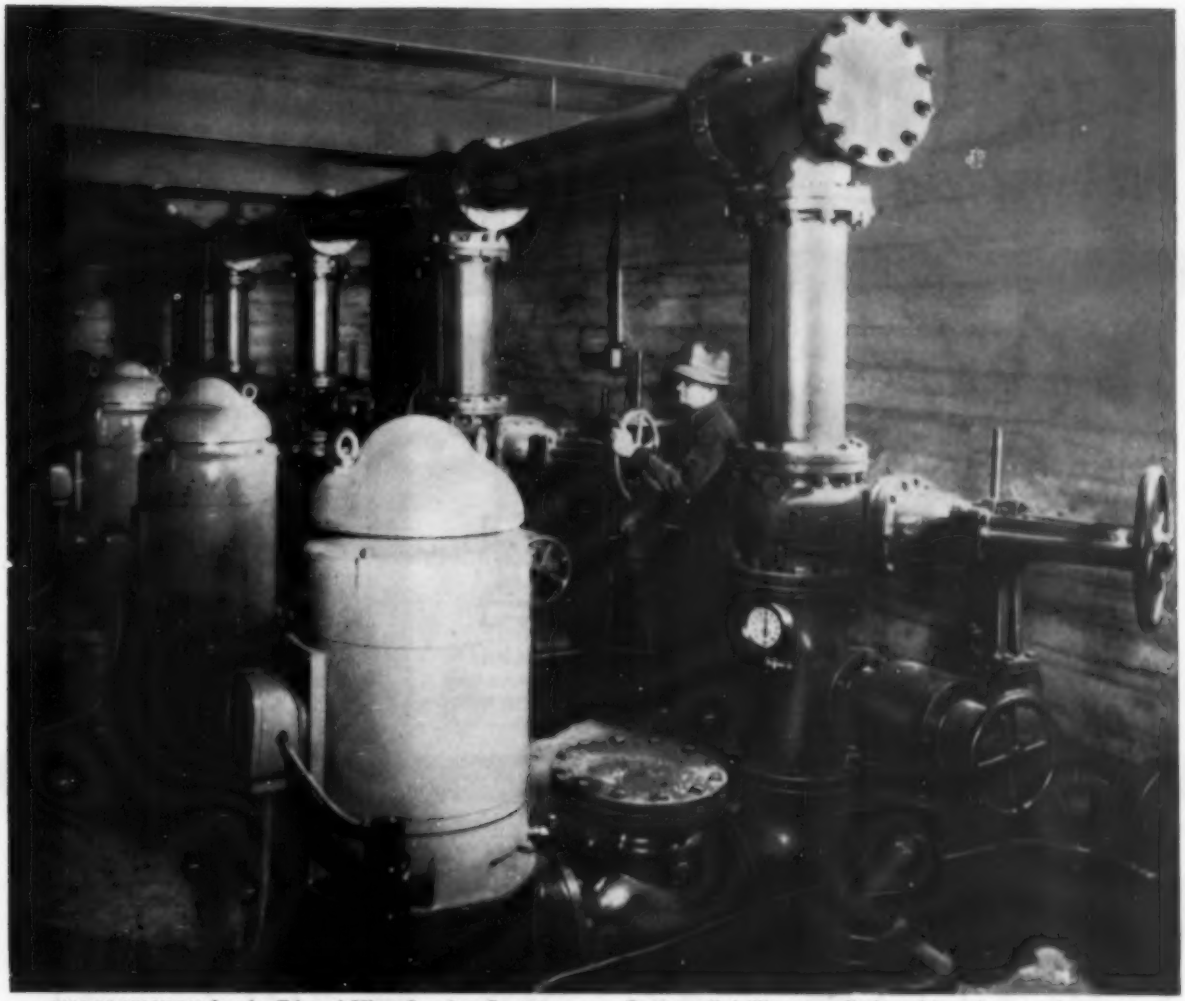
Timber Engineering Company laboratories have been running test on a wood laminated product called Doweloc. It is made of various lengths of tongue and grooved edge hardwood strips fastened together with spiral steel dowels spaced on 12 in. centers. It comes in 12-in. widths and in thicknesses of 1, 1½, and 2 inches. It is said that this unusually stable wood construction is suited for industrial floors, loading platforms, load-bearing partition walls, freight elevator floors, and other application where stability and strength is required.

What About Windows

Engineers and architects are paying much more attention to factory windows. A number of new plastic type products have been put on the market to replace glass in factory windows. Various types of glass brick are also being pushed, and then there is the question of whether there should be any windows at all. (See "Does It Pay to Brick Up Windows," page 56.)

Chemical Nickel-Plating

The American Locomotive Company has developed a new nickel-plating method that has been used on work for the Atomic Energy Commission during the past six months. With this chemical nickel-plating process, a uniform thickness can be applied to any metal surface no matter how intricate the shape. It is said that this new process eliminates the need for specifying pure or wrought nickel for shapes too complicated to be plated electrolytically. Now such items can be fabricated of inexpensive metals and plated by the new chemical process.



FIRE PROTECTION for the Edward Hines Lumber Company is assured by four Worthington vertical turbine fire pumps. Costly well drilling was eliminated here because the versatile Worthington pumps take water from a nearby river.

We hope these Worthington pumps are never used!

Don't get us wrong. They're good pumps. Can't be beat for always-adequate pressure, long life and real dependability.

Thing is, though, they're fire pumps — Worthington vertical turbine fire pumps — ready to supply water for the sprinkler system at the Edward Hines Lumber Company in Westfir, Oregon.

Main point — if and when they're ever needed, these Worthington pumps will go to work instantaneously, delivering enough water to quench any fire. Reason is they're always primed. And on top of approval by Factory Mutual and Underwriters Laboratories, they're guaranteed by Worthington to deliver rated capacity — whether pumping from a deep well or from a surface supply.

Our bulletin W-450-B42 tells all about the Worthington vertical turbine fire pump. Write for it today — you may be glad you did. Worthington Corporation, Vertical Turbine Pump Division, Harrison, N.J. 4.29

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER — IT IS A VALUABLE RESOURCE

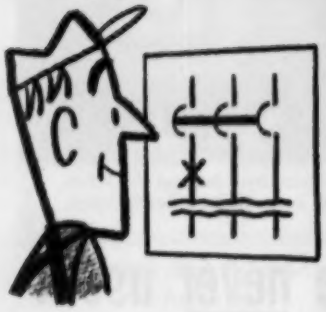
Circle 504 on Reply Card for more data

10 reasons why it's wise to buy

1 They offer the highest degree of personnel protection. Live parts are covered, even when enclosure cover is open.

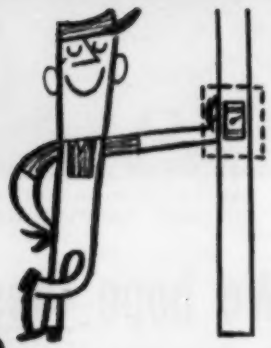
2 They reduce production downtime. No time is lost locating or replacing fuses. Breaker can be reset as soon as fault is cleared.

3 They eliminate replacement costs and maintenance. First cost is the last. No replacement parts or fuses are needed.



6 They prevent possible single phasing when a fault occurs. All poles trip simultaneously.

7 They safely carry continuous current rating indefinitely. Breakers must carry 100% of load indefinitely without exceeding temperature limits.



8 They save mounting space. Require less space than same rated enclosed fusible switch.

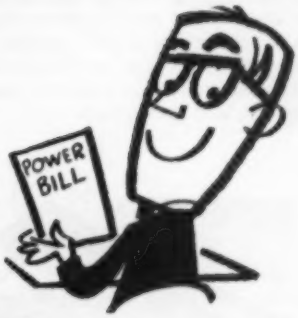
Nema 1 Enclosure | "F" Frame Breaker | Nema 1A Enclosure | "KL" Frame Breaker | Nema 7 Enclosure

I-T-E Circuit Breaker Protection

4 They are completely tamperproof. Breaker is calibrated and sealed at the factory.

5 They are twice-tested individually at the factory to insure uniformity of operation in the field.

9 They can be equipped with internally mounted auxiliary devices for under-voltage protection, remote tripping and indication of circuit condition.



10 They incur low watts loss. Welded connections and silver alloy contacts provide low watts loss throughout the life of the breaker.

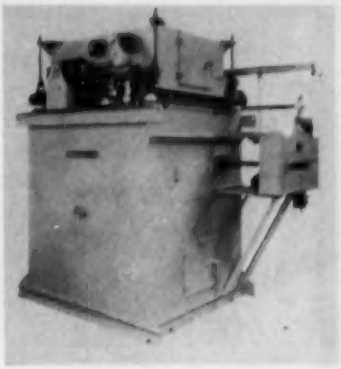
I-T-E Molded Case Circuit Breakers are rated through 600 volts a-c, 250 volts d-c, 10 through 600 amp. I-T-E also supplies a complete line of enclosures for all applications. Contact your I-T-E representative or authorized distributor for the Speedfax Catalog. Or write Small Air Circuit Breaker Division, I-T-E Circuit Breaker Company, 19th and Hamilton Sts., Philadelphia 30, Pa.

I-T-E CIRCUIT BREAKER COMPANY • Small Air Circuit Breaker Division

Circle 505 on Reply Card for more data

new equipment

. . . new developments

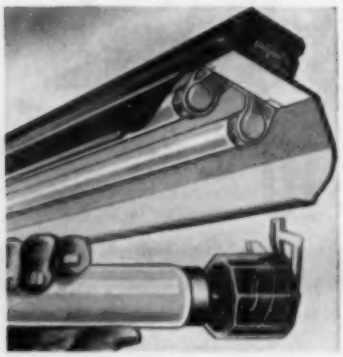


B10 BATCHING SCALE announced by Richardson Scale Co. is specially designed for weighing hot materials in high-tonnage quantities. Key features include heavy-duty construction, an extra-large weigh hopper (25 cu ft), a dust-tight housing covering the entire scale, separately-housed controls, and ⅜ in. steel plate contacting the material being weighed. Remote controls are available.

B12 SWITCH—Automatic Switch Company's Bulletin 920 Remote Control Switch is now available with a control line fuse and adapter. The adapter may be purchased as a separate item and added to an existing remote control switch, or the adapter may be obtained as an integral part of a new switch. Bulletin 920 Remotes are designed for installation on panel boards, switchboards, and sub-panels.

B14 GEAR UNITS—The Philadelphia Gear Works, Inc. has developed an improved line of gear units to be known as Hi-Speed gear units for speed reduction and increase of service. Rotating speeds up to 9000 rpm and pitch line velocities to 10,000 ft per min can be accommodated without modification. Units are available in 17 sizes for ratings up to 7100 hp and in any specified ratio from 1:1 up to 10:1.

B11 VALVES—Improvements in the operating mechanisms of its 880 Series of hand and foot valves are announced by Ross Operating Valve Co. These valves are available with single or double foot treadle, vertical or horizontal hand lever controls. Pipe sizes are ¼ and 3/8 in. in three-way and four-way models.



B13 FLUORESCENT lighting units known as the Magna-Flo line, with Springlox lampholders, have been designed by Benjamin Electric Mfg. Co. for T-12 Slimline lamps. Lampholders are all metal, one-piece construction, and are positioned in channels by slots that permit rigid mounting.

B15 DUCT FURNACES developed by Reznor Manufacturing Co. make it possible to install custom engineered heating systems with total capacities of 2 million Btu and above from sections weighing 315 lb or less. Two series are available: from 150,000 to several million Btu; and from 50,000 to 125,000 Btu.

NOTE—Each new product item has a key number for your convenience in asking for additional, detailed information. Circle this number on Reply Card, pages 34/35 & 74/75.

BETZ • *A Great Name In Water Conditioning*

Welcome visitor...

The Betz District Engineer is a welcome visitor wherever he goes. As our personal representative to industrial plants, petroleum installations, institutions . . . plants like yours, he plays an all-important role in our continuing efforts to engineer *controlled* water conditioning.

His job carries many responsibilities. For example, he

. . . instructs your plant operators in Betz-engineered water conditioning control techniques (chemical feed, water testing, chemical adjustment, blowdown control, etc.).

. . . makes regularly scheduled visits to your plant to review operating conditions.

. . . reviews plant control and offers "on-the-spot" constructive criticism and advice.

. . . checks testing procedures, test solutions and chemical feed equipment.

. . . inspects plant equipment and visually observes the results obtained.

. . . discusses any and all water problems with you and your operating personnel.

. . . prepares and submits a complete written report before leaving your plant.

And equally important, he works closely with the Betz headquarters engineering staff to assure the individual attention required for sound, economical water conditioning.

Next time a Betz District Engineer calls, ask him to explain how Betz *completely-integrated* water conditioning service can obtain results in *your* plant. He'll be happy to give you the details.

W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa. In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

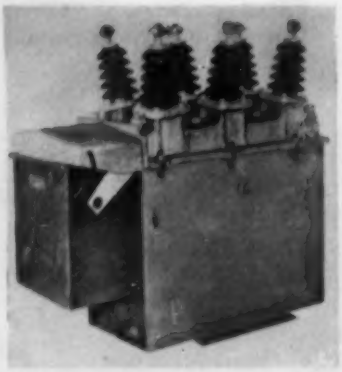
Circle 506 on Reply Card for more data

new equipment

—Starts on page 10

B16 IMPULSE STEAM TRAP — The No. 40 Series Yarway high capacity impulse steam traps are specially designed to handle higher condensate loads. Capacities are approximately 2 to 3 times that of the same size No. 60 Series Yarway traps. Temperature and pressure range are 750 F and 600 psi. The traps are of particular value for applications where dirt and scale are a problem, according to the manufacturer Yarnall-Waring.

B17 FUSE CUTOUTS, enclosed, with all operating functions available in one basic design, are announced by the Distribution Dept., General Electric Co. One housing and four interchangeable doors in each voltage and current rating allow flexibility. Choice of doors provides for normal duty indicating or dropout, normal duty indicating non-dropout, indicating heavy duty or extra heavy duty, and disconnect functions. Cutouts are available in ratings of 5.2 kv and 7.8 kv, in continuous ratings of 50 amp and in all applicable NEMA Standard interrupting current ratings.



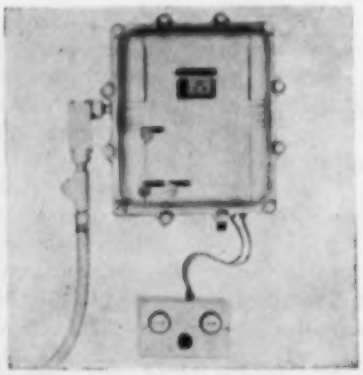
B19 RECLOSER, 50 amp, Type 50-GR-3, for use on 2.3 to 5.5 kv distribution systems is available from Westinghouse Electric Corp. The three-pole unit is designed for use where larger interrupting capacity is not necessary. It is particularly adapted for use with sectionalizers to provide coordinated fault protection on lightly loaded distribution lines. Mounts on pole or in substation.

B22 GEARED JOINT, a mechanical device for transmitting torque around a bend, has no maximum angle of operation. Primary use is for making sharp bends with flexible shaft or reach rod remote controls for valves. Made by Stow Manufacturing Co., the joints are available in three sizes: 500, 2000, and 3500 lb-in. maximum recommended operating torque.

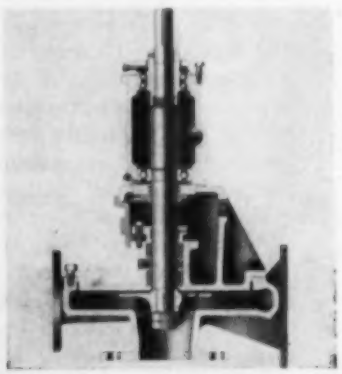
B20 LOCKPRIME, a corrosion resistant liquid primer for new or corroded steel surfaces, can be applied by brush or roller directly from the can, according to the manufacturer Pennsylvania Salt Mfg. Co. On sandblasted new steel or wirebrushed rusted steel, it forms a tight adherent bond and provides good adhesion for following top coats.

B23 TURBINE PUMPS — A. O. Smith Corp. has added to its line of industrial vertical turbine SMITHway pumps, units in 10, 12, and 14 in. sizes covering the range from 400 through 2100 gpm. New hydraulic and mechanical design incorporates an impeller type which produces higher head and efficiency with low npsh.

B18 FLOW VALVES — Constant flow valves announced by Askania Regulator Co. maintain rate of flow of fuel oil or other non-abrasive fluids within 1 percent up to 200, 300, 400, 500, 600, or 700 gph as desired. They also regulate flow of fluids with viscosities as high as 250 ssu at operating temperature, static pressures up to 500 psi, and temperatures up to 250 F.



B21 CONTROLLER — The Series 42 radio frequency capacitance bridge developed by the Robertshaw-Fulton Controls Co., is designed primarily for measurement and control of levels of liquids, granular solids, interface, and other conducting or non-conducting substances. Because it is of the capacitance type, the instrument may be used for other process variables.



B24 CHEMICAL PUMPS engineered for handling acids and other corrosive chemicals have been developed by Byron Jackson Co. to incorporate the "most wanted" features listed by users in a special industry survey conducted by BJ. Four basic pump sizes, available in various motor and impeller combinations, cover a capacity range from 20 to 400 gpm.

How to Select an Economical Temperature Regulator

First of all, what does economy mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

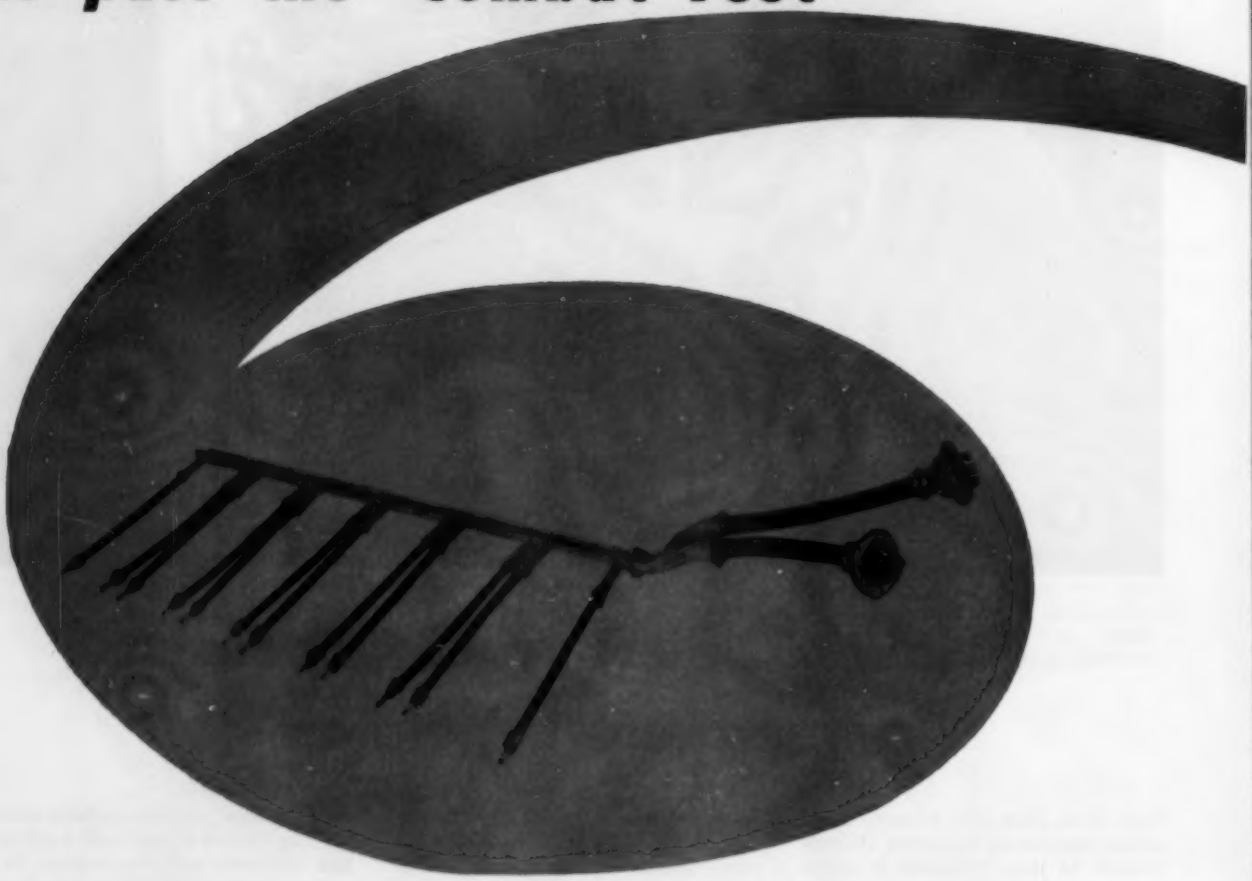
• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you *could* expect so much. And perhaps you didn't realize that Spence Temperature Regulators offer all these features and more. May we send you our Bulletin T500 containing further details? 6E-138

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

Circle 507 on Reply Card for more data

it takes RUGGED WIRING *to pass the "Combat Test"*



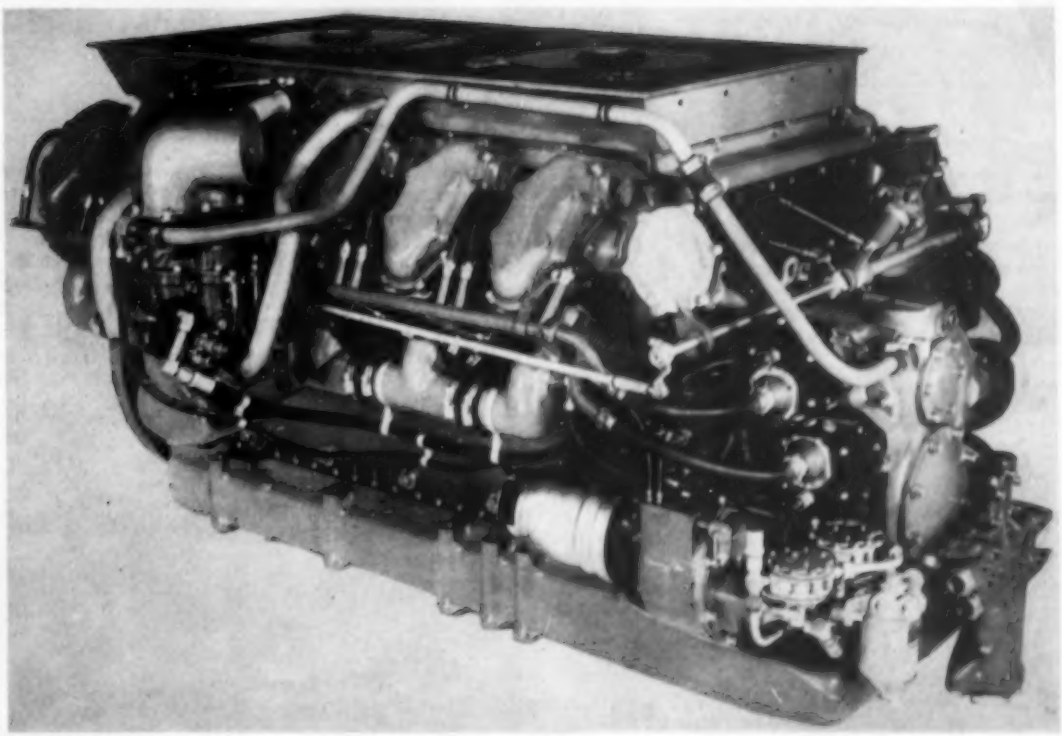
This 810 hp air-cooled engine, now available from Continental Motors Corporation for industrial applications, was first designed for the Army's famed General Patton tank. The electrical wiring ignition harness, a product of National Electric, is a high voltage, radio-shielded system. As a vital part of the Patton tank engine, it proved rugged enough for combat—resistant to extremes of heat and cold — impervious to dirt and dust of all types.

This is the kind of ignition harness you need on your industrial engines whether they are in continuous service or on vital stand-by duty. With National Electric ignition harnesses, you can be sure of quick starting, no matter how long the engine has been standing-by, to power an emergency generator or drive a fire pump. That is the reliability that comes from "combat testing."

Electrical wiring ignition harnesses are only one of the many products National Electric manufactures to provide better and more effective electrical distribution for industry.

More Than A Quarter Century Of Experience.

Control panels
Switchboard panels
Electrical timing mechanisms
Electrical temperature indicators
Automatic relay and switching devices
Electro-mechanical assemblies — manufactured to customers specifications



National Electric Manufacturing Company

NILES MICHIGAN

Circle 508 on Reply Card for more data

new equipment

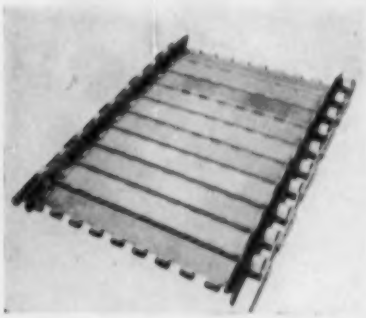
—Starts on page 10

B25 COUPLINGS designed particularly for boiler fan drives where heat of hot gases handled may cause expansion and misalignment are announced by The Hilliard Corp. Known as the Types 95 and 96 Automatic Over-Running Couplings, the units are also for use on any installation where supporting members may be subject to deflection which would affect the shaft alignment. Both types accommodate end float but type 96 is constructed with special clearance for unusually great axial expansion.

TO REQUEST ADDITIONAL DATA

Circle "key" numbers on Reply Card between pages 34/35 & 74/75. Your requests will be handled promptly.

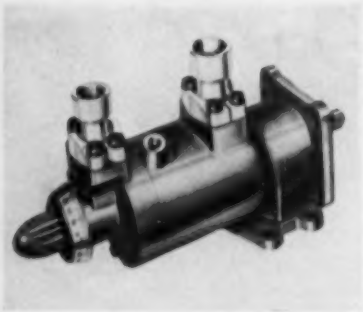
B26 SAFETY SWITCH—The 100 amp circuit breaker safety switch, introduced by Heinemann Electric Co., is in an enclosure which occupies half of the space required by comparably rated fused switches. Unit is designed for service on 120/240 v ac, in two or three wire installations. The unit employs general purpose type circuit breakers in standard ratings of 70 or 100 amp.



B27 CONVEYOR BELT — May-Fran Engineering, Inc. has developed a hinged-steel conveyor belt with a dimpled surface to eliminate discharge problems experienced with flat surface belts handling small, flat, light-gage metal parts or scrap. The belting will handle hot, heavy, and abrasive materials and can be added to from stock parts.

B28 CHEMI-DRAIN Channel Pipe has been developed jointly by Dow Chemical Co. and Logan Clay Products Co. for the handling of highly-corrosive wastes from chemical manufacturing processes. The pipe is resistant to most chemicals and gases, including all concentrations of sulphuric acid. Designed for sloping gutters and drains handling corrosives, Chemi-Drain is manufactured in three-ft lengths.

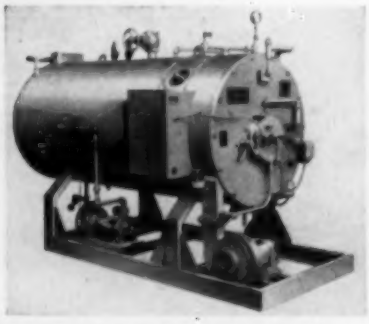
B29 FLOOR PATCH known as Trowel-In can be used for resurfacing or patching concrete, stone, brick, or wood floors. Applied only ⅜ in. deep it does not raise floor level appreciably and is easily trowelled in around obstructions, according to manufacturer, Flexrock Co. Floors are ready for traffic in 18 hr.



B30 HYDRAULIC PUMPS — For systems requiring constant high pressures with control of fluid delivery from zero to full flow, Dudco Div., New York Air Brake Co. announces two series of high pressure, variable delivery hydraulic pumps. Series PVM-600 pumps are equipped with handwheel control for manual adjustment of output; Series PVC-600 pumps incorporate a pressure compensated control for automatic regulation of pressure and flow.

B31 THE FIRE GUN, a portable hand-operated heat tool that burns propane, is available from Fire Gun Sales Corp. With a heat range of 4000 to 117,000 Btu per hr, the unit is for applications that are within or beyond the capacity of conventional blow torches or soldering irons. Basic Fire Gun kit includes heat concentrator tip, high heat or blow torch tip, soldering iron tip which is equivalent to a 12 lb commercial iron, hose, regulator, pressure gage, and carrying box.

B32 STEAM TRAPS for low, medium, and high pressure are announced by Strong, Carlisle & Hammond Co. Known as the Hydro-Flex steam trap, the line is available in semi-steel, cast steel, and forged steel construction for use on all pressures up to 2500 psi and temperatures to 1100 F. The trap is said to provide high operating efficiency under all load conditions.



B33 PACKAGED BOILERS, known as the Model Y line, feature 3-pass design with simple refractory and baffles for ease and low cost of cleaning and maintenance. Available in sizes up to 500 hp and pressures up to 200 psi, the boilers are shipped ready to fire, with burner, controls, insulation, and jacket. Ames Iron Works, Inc.

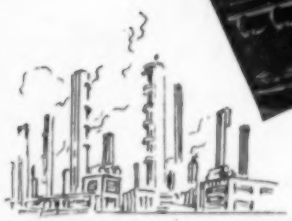
THIS 400,000 Pounds per HOUR

Vogt

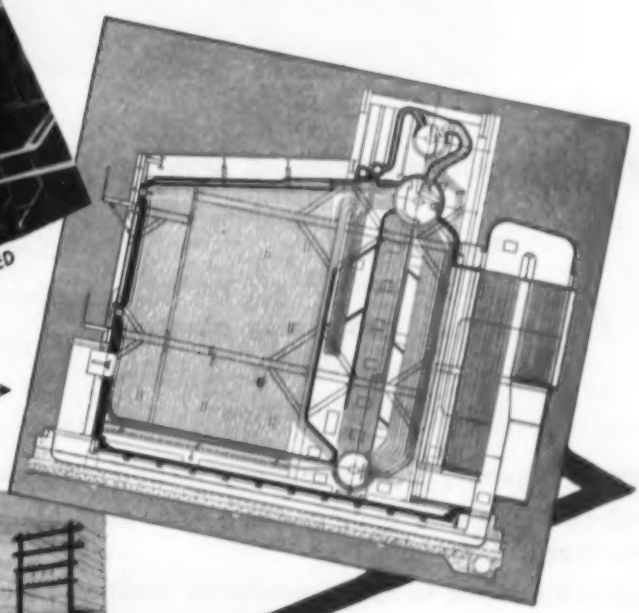
STEAM GENERATOR

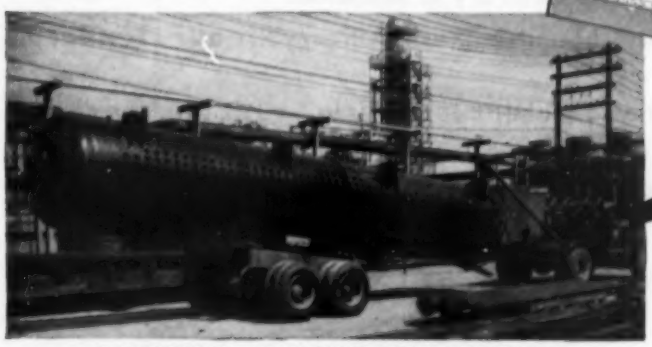
Gives Top Performance in a Leading Texas Petroleum Refinery

VIEW OF THE COMPLETED STEAM GENERATOR



RIGHT → LONGITUDINAL SECTION THROUGH THE UNIT.





6'-6" DIAMETER x 37'-0" LONG STEAM DRUM BEING TRANSPORTED TO THE ERECTION SITE DURING INSTALLATION.

PRINCIPAL DATA

400,000 pounds per hour capacity.

Fusion welded steam and water drums designed for 700 lbs. S.W.P.

Superheater delivers steam at 750°F. total temperature.

Water cooled furnace.

Burners for Oil and Acid Sludge fuel.

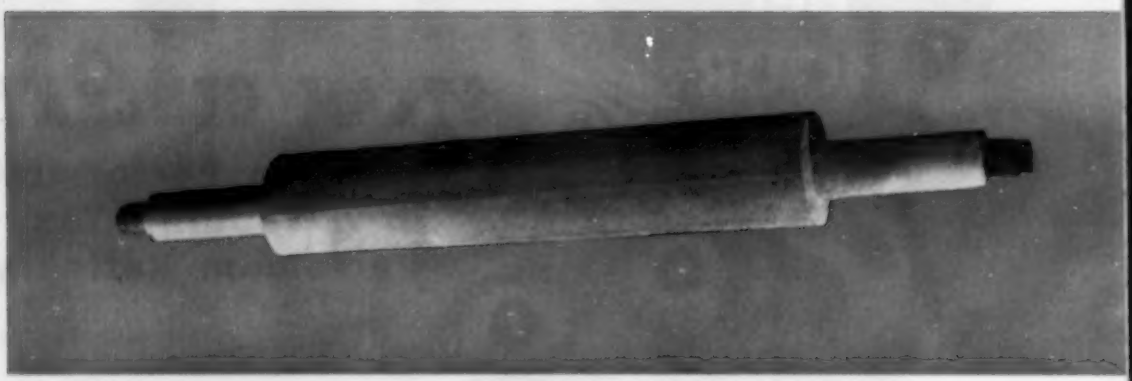
Vogt builds a complete line of bent tube steam generators designed to burn solid, liquid, or gaseous fuels to meet specific operating conditions. Write for bulletins.

HENRY VOGT MACHINE CO., LOUISVILLE 10, KY.

BRANCH OFFICES: New York, Philadelphia, Chicago, Cleveland, St. Louis, Dallas, Charleston, W. Va.

Circle 509 on Reply Card for more data

Minimize Costly Delays



Rubber Covered Rolls . . .

for

- *paper mills*
- *steel mills*
- *food processing plants*
- *textile finishing*
- *process industries*

Where a quality job is important — and quick delivery is essential.

Vail can keep your plant running more days because "Rush Delivery" is our standard practice.

Vail is equipped to apply natural or synthetic rubber coating ⅛ in. to 3 in. thick on cores 1 in. to 34 in. O. D.

Vail does custom coating to your specifications for temperature, chemical resistance, and hardness.

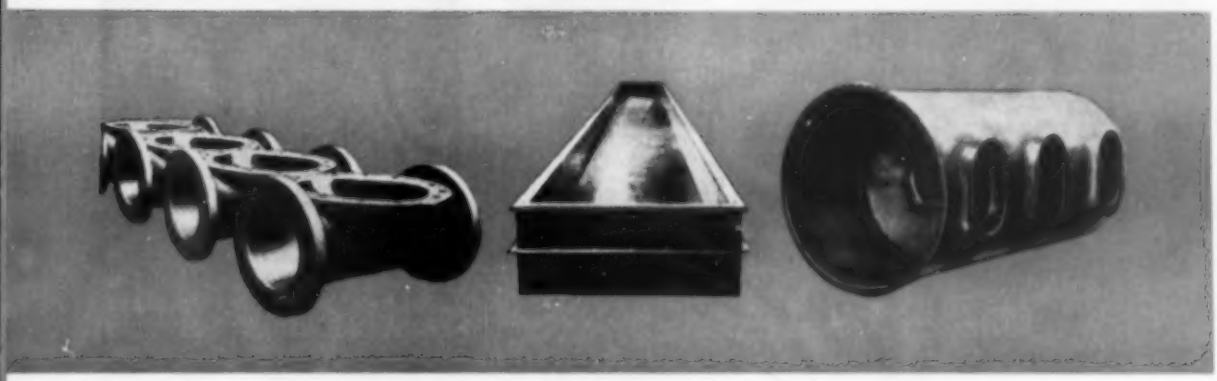
for

- *custom quality*
- *quick delivery*
- *special specifications*

VAIL RUBBER WORKS, Inc.

ST. JOSEPH, MICHIGAN

and Output Losses



. . . Rubber Lined Equipment

for

- *protection against corrosion*
- *avoiding product contamination*
- *economical handling of abrasives*

The tested answer is a rubber lining, natural or synthetic, engineered to your specifications. Vail can "Rubber Rate" the job to meet your particular needs.

Custom Engineered Linings

for

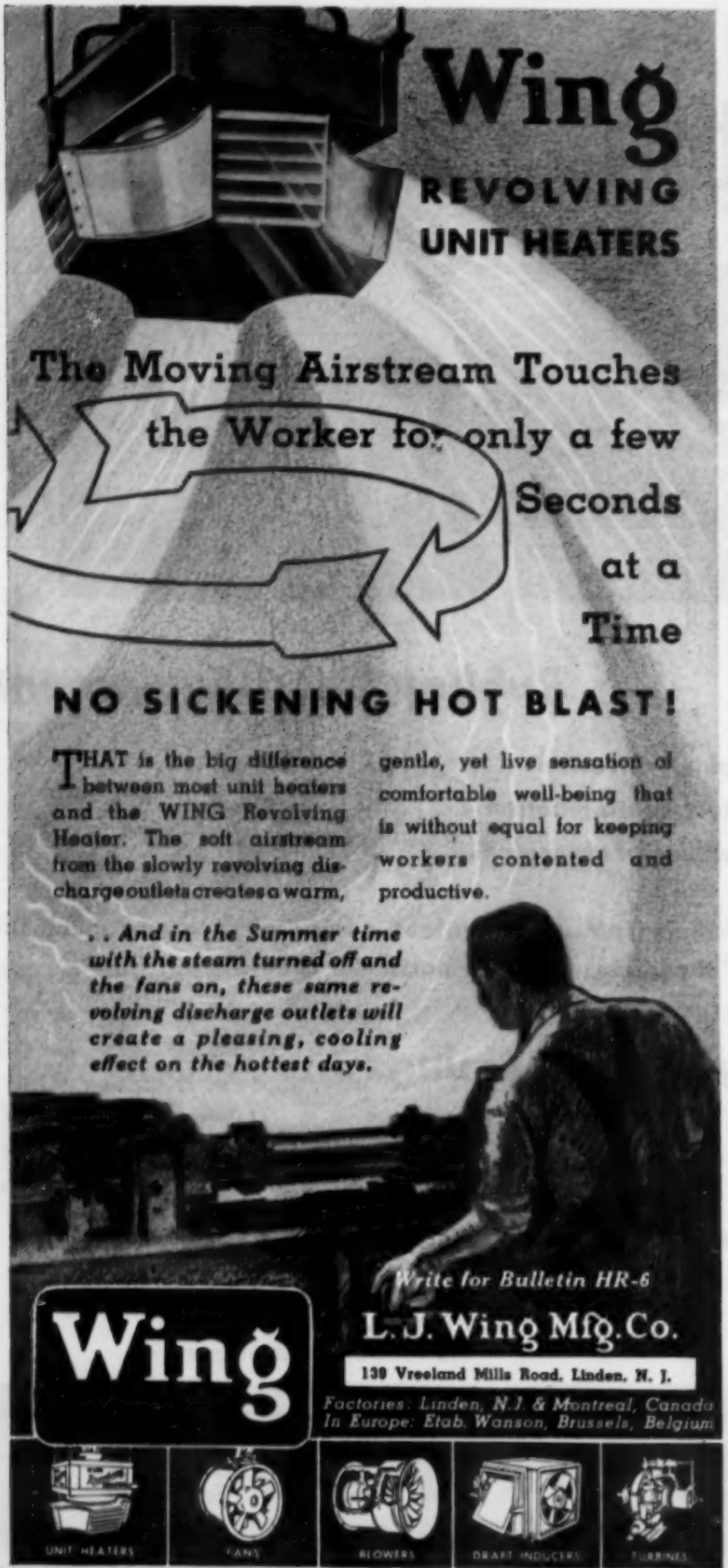
- *tanks*
- *vats*
- *piping*
- *valves*
- *special process equipment*

VAIL RUBBER PRODUCTS Corp.

Subsidiary of Vail Rubber Works, Inc., St. Joseph, Mich.

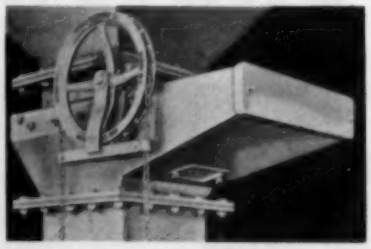
Calumet Division • 1814 Summer Street • Hammond, Indiana

Circle 510 on Reply Card for more data

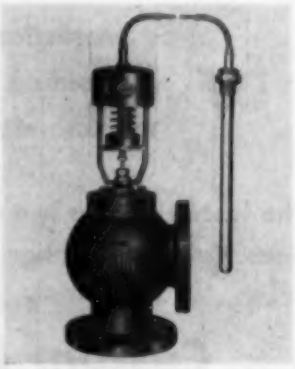

Wing
REVOLVING
UNIT HEATERS
The Moving Airstream Touches the Worker for only a few Seconds at a Time
NO SICKENING HOT BLAST!
THAT is the big difference between most unit heaters and the WING Revolving Heater. The soft airstream from the slowly revolving discharge outlets creates a warm, gentle, yet live sensation of comfortable well-being that is without equal for keeping workers contented and productive.
. . And in the Summer time with the steam turned off and the fans on, these same revolving discharge outlets will create a pleasing, cooling effect on the hottest days.
Write for Bulletin HR-6
Wing
L. J. Wing Mfg. Co.
139 Vreeland Mills Road, Linden, N. J.
Factories: Linden, N.J. & Montreal, Canada
In Europe: Etab. Wanson, Brussels, Belgium
UNIT HEATERS
FANS
BLOWERS
DRAFT INDUCERS
TURBINES
Circle 511 on Reply Card for more data

new equipment

—Starts on page 10



B34 COAL VALVE — Stock Equipment Co. has designed the S-E-Co coal valve to operate easily under adverse conditions of dry dusty coal or fine wet coal. Because of its dust-tight construction, self-cleaning racks and pinions, steel gate, and large ball bearing equipped gate supporting rollers it can be used in many chemical processes, cement plants, steel mills, and foundries.



B35 TEMPERATURE regulators developed by O. C. Keckley Co. may be mounted directly on heat exchangers, instant water heaters, and other equipment that have inlet connections on the top. Known as Angle Type T, the regulators have wearing parts of stainless steel or bronze that can be renewed. They are available with screwed connections in sizes from ½ to 2 in. and with flange connections from 2 to 8 in.

B36 FORGED STEEL TRAPS for draining water from compressed air or gas systems at pressures up to 3000 psig where no gas loss is permissible have been developed by Armstrong Machine Works. Non-collapsible, spring-balanced

Simple and RUGGED...

CHAPMAN'S MOTOR UNIT for Valves, Floorstands and Sluice Gates

Floorstand equipped with Motor Unit . . . control panel, motor, limit switch and push button station.

Simple, durable mechanism of Chapman's Motor Unit. Handwheel remains stationary during motor operation.

Chapman Motor Units have fewer components than any other units, providing greater dependability, much lower maintenance costs.

There are only two pinions and two gears in the motor reduction train: drift is eliminated and lash is negligible. Your valves seat tight, but not too tight. Operation is *always* smooth and trouble-free.

You can mount the Chapman Motor Unit in any position, at any angle required. The rugged stub-tooth gears require no grease or oil bath . . . yet run smoothly, quietly, with minimum wear.

Weatherproof and steam tight, Chapman's floorstand units are shipped completely wired, ready to connect to your power leads, for easy, rapid installation. This modern motor unit is dependable and economical. Send for *new* catalog No. 51.

The CHAPMAN Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

Circle 512 on Reply Card for more data

...use Heinemann Breakers!

they're fool-proof

Send for your copy of Manual 101...
"What You Should Know About Circuit Breakers".

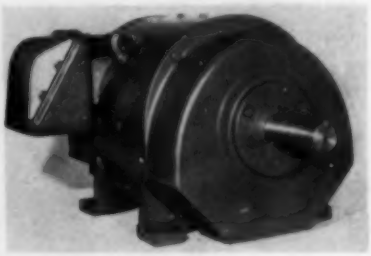
HEINEMANN ELECTRIC CO., 140 PLUM STREET, TRENTON 2, N. J.

Circle 513 on Reply Card for more data

new equipment

—Starts on page 10

open float normally holds valves closed by weight of water in bucket compressing the spring. Capacity at 2000 psig is 2000 lb per hr. Working parts are stainless steel and body and cap are ASTM F-5 chrome moly steel.

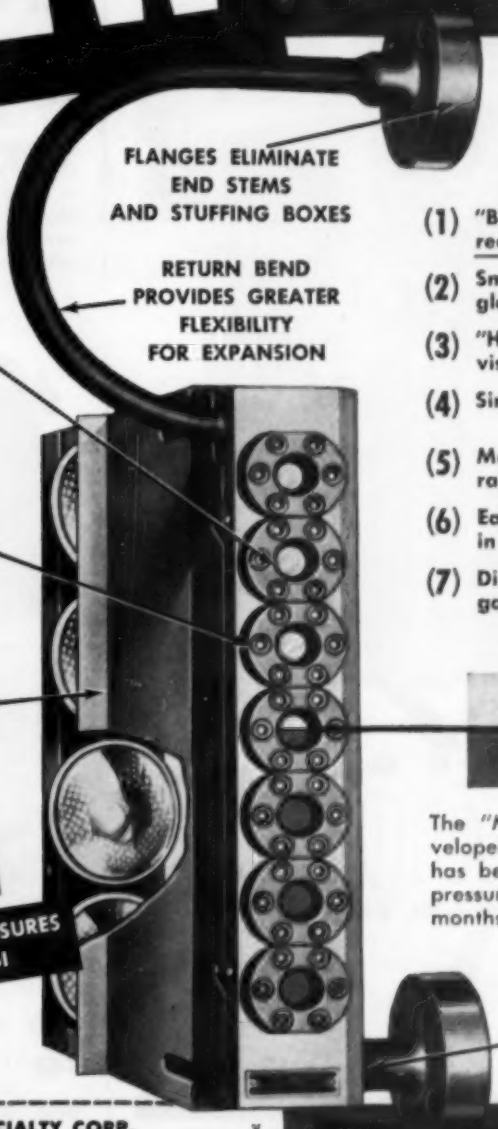


B37 D-C MOTORS — The Super 'T' Line of industrial d-c motors developed by Reliance Electric and Engineering Co. features ruggedness, ability to take full load and overloads, to change speed rapidly, to maintain torque and tension, and to reverse and stop quickly. Size range is now 20 to 100 hp and will be extended to higher and lower horsepowers.

B38 FLEXIBLE CONNECTORS to control thermal expansion in wet heating systems are announced by the American Brass Co., American Metal Hose Branch. To be known as Flexpipe, the connectors consist of seamless flexible phosphor bronze tubing with brass NPT male fittings attached to each end. A wire braid covering adds strength. The assemblies are in diameter sizes ¼ through 1½ in., in over-all lengths 8 through 28 in.

B39 CABLEMATIC lighting, a simple, counter-balanced system for elevating and lowering lighting fixtures, makes it possible to relamp or clean without ladders. A single cable, which lays along side

NEW DIAMOND "MULTI-PORT"® Bi-Color Gauge



FLANGES ELIMINATE END STEMS AND STUFFING BOXES

RETURN BEND PROVIDES GREATER FLEXIBILITY FOR EXPANSION

SMALL ROUND INDIVIDUAL PIECES OF MICA AND GLASS

PORT PARTS REPLACED WITHOUT REMOVING GAUGE FROM BROILER

"HI-LITE" ILLUMINATOR

FOR BOTH NEW AND OLD BOILERS

FOR BOILER PRESSURES TO 3000 PSI

WELDED CONSTRUCTION ASSURES PERMANENT TIGHTNESS

6962

"MULTI-PORT" Advantages:

(1) "Bi-Color" principle shows steam red and water green

(2) Small round ports instead of long glass strips

(3) "Hi-Lite" illuminator for improved visibility

(4) Simplified high-pressure construction

(5) Maximum thermal stability for rapid starting

(6) Easy, inexpensive maintenance . . . in place

(7) Direct reading . . . basic reference gauge

STEAM SHOWS RED

WATER SHOWS GREEN

The "Multi-Port" gauge has been developed over a four-year period and has been in continuous successful high pressure operation for more than 18 months in several leading central station plants. For additional information, write for new Bulletin 1174 . . . use the coupon below.

SEND TODAY

DIAMOND POWER SPECIALTY CORP.
LANCASTER, OHIO

Please send me without obligation a copy of new Bulletin No. 1174 explaining the advantages of the Diamond "MULTI-PORT" Bi-Color Gauge.

NAME_____

COMPANY_____

ADDRESS_____

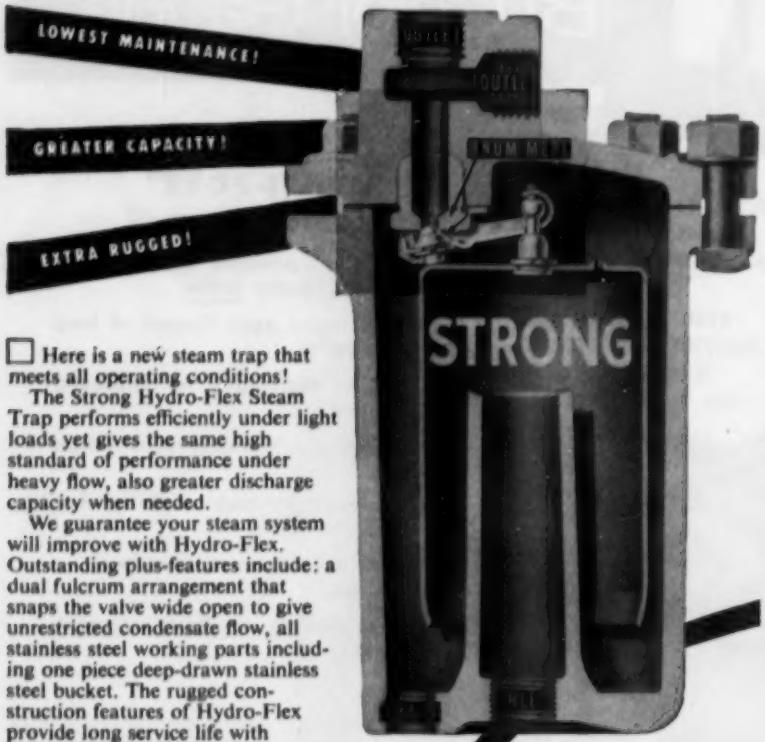
DIAMOND POWER SPECIALTY CORP.
LANCASTER, OHIO
Diamond Specialty Limited—Windsor, Ontario

Circle 514 on Reply Card for more data

NEW WAY TO

REDUCE STEAM COSTS

AND INCREASE PRODUCTION



☐ Here is a new steam trap that meets all operating conditions!

The Strong Hydro-Flex Steam Trap performs efficiently under light loads yet gives the same high standard of performance under heavy flow, also greater discharge capacity when needed.

We guarantee your steam system will improve with Hydro-Flex. Outstanding plus-features include: a dual fulcrum arrangement that snaps the valve wide open to give unrestricted condensate flow, all stainless steel working parts including one piece deep-drawn stainless steel bucket. The rugged construction features of Hydro-Flex provide long service life with minimum maintenance.

Your local Strong distributor will give you complete information or write us for Bulletin No. SS-40.

STRONG, CARLISLE & HAMMOND COMPANY
1392 W. 3RD. STREET • CLEVELAND 13, OHIO

STRONG
HYDRO-FLEX
STEAM TRAPS

high efficiency under all condensate loads

HORIZONTAL TYPE SERIES
Hydro-Flex traps with horizontal inlet have the same features as bottom inlet types.

Available from over 200 industrial distributors in the United States, Canada and Foreign Countries.

3 types available for wide range application . . . to meet pressure and capacity requirements.

PRESSURE REGULATING VALVES

are custom sized for job demands. Bolted body permits non-threaded seats and wide selection of seat sizes.

BLOW-DOWN VALVES

STRONG STRAINERS
Offer maximum protection from dirt, scale or sediment. Available in semi steel, cast steel and bronze.

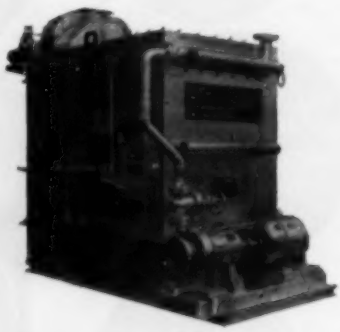
Circle 515 on Reply Card for more data

new equipment

—Starts on page 10

the race way, is used on a line of fixtures. Both ends of the cable are anchored with enough slack provided to lower one fixture at a time. A counter weight takes up the cable slack. Wil-Son Mfg. Corp.

B40 SAFETY SWITCHES in 30, 60, 100, 200, 400, and 600 amp capacities in Type D (NEMA Type G) are available from Federal Pacific Electric Co. Units are available in raintight enclosures with mounting ears that facilitate installation on posts and irregular surfaces.



B41 PACKAGED HEATERS, known as the International-LaMont Thermal Liquid Heaters, incorporate the LaMont principle of forced recirculation, and provide process system temperatures to 750 F with tolerances of ± 2 F. By maintaining fluid velocities of 5 to 8 ft per sec, maximum heat absorption and operating economy is obtained according to the manufacturer, International Boiler Co.

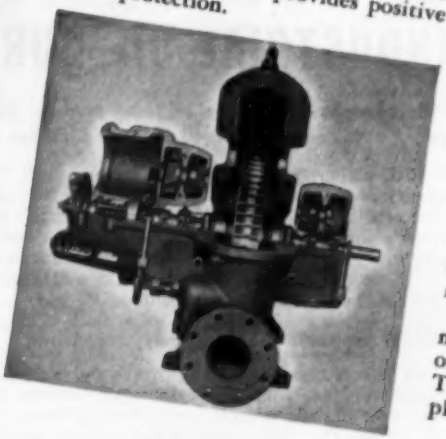
B42 HYDRAULIC HOSE and couplings, known as Surgepruf, for medium-high and high pressure service, are offered by Joy Manufacturing Co. No special tools or mandrels are required for assembling and the coupling can be retightened if necessary, without disassembly. Manufactured to JIC standards, the units feature a "double-wedge" grip which makes possible assembly on rubber covered hose without skiving.

TERRY

PROTECTION OF TURBINE BLADES made possible by nozzle location

The Terry Solid-wheel Turbine is of the impulse, helical flow type. The steam issues from an expanding nozzle at high velocity and enters the wheel bucket where its direction is reversed 180°. As this single reversal uses but a portion of the available energy, the steam is returned to the wheel several times until practically all of the energy has been utilized. This principle makes possible the efficient use of steam in a single-piece, almost indestructible wheel.

In the Terry Solid-wheel Turbine, the steam enters the buckets in a direction at right angles to the shaft, as shown above. This design eliminates the need for close clearances and provides positive blade protection.



The blades cannot foul. There is a one inch clearance on either side of the wheel. In addition, projecting rims on each side of the buckets prevent damage to the blades even though external thrust should move the wheel.

This is only one of the many important features of the Terry Solid-wheel Turbine. Write for complete details.

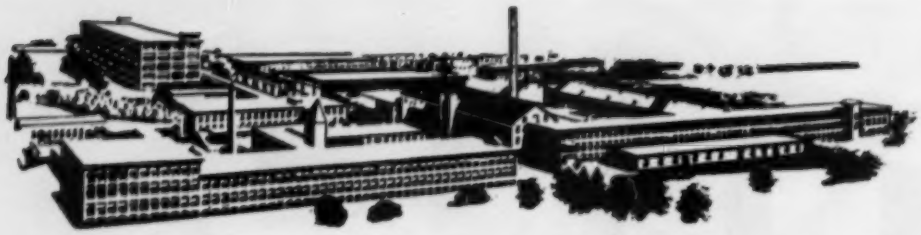
THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TT-1195

Memo

Send for a copy of bulletin S-116 which describes the many advantages of the Terry Solid-wheel Turbine.

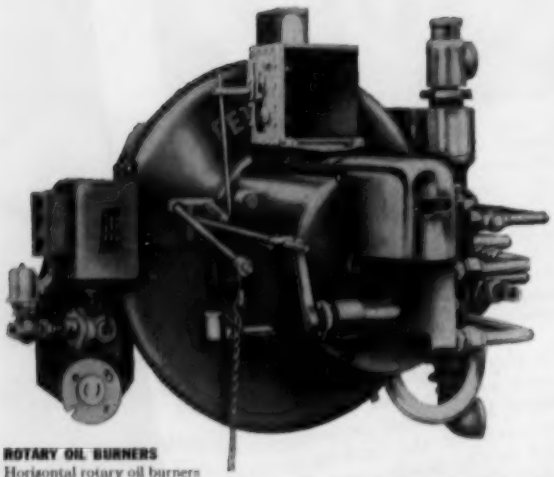
Circle 516 on Reply Card for more data



DAVIS & FURBER MACHINE COMPANY, NORTH ANDOVER, MASS.

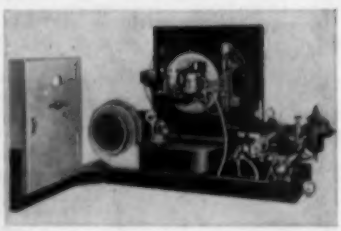
SAVED $12,000

on fuel the first year with



ROTARY OIL BURNERS
Horizontal rotary oil burners make possible substantial fuel savings by burning the low-cost heavy fuel oils with complete dependability. Models for every industrial need. Capacities up to 600 boiler horsepower.

COMPLETE PACKAGED UNIT
A complete forced draft combustion system with all parts factory-assembled and tested. Saves installation time and cost, gives top performance and fuel economy.



Mail this coupon for Free Catalog

PETRO
3222 West 106th St., Cleveland 11, Ohio.
In Canada: 2231 Bloor St., West, Toronto, Ontario.

Please send the 20-page illustrated Petro catalog.

Name _____

Company _____

Address _____

City _____ State _____

PETRO

T. M. REG. U. S. PAT. OFF.

INDUSTRIAL OIL BURNERS

"The changeover to Petro oil firing paid for itself the first year," says Forbes Rockwell of Davis & Furber

PETRO oil burners do *two* jobs in this huge plant. They produce steam for heat and generate the electric power for plant operation. "We consider it nothing short of a minor miracle the way your dealer's engineering department came in here and changed us over to oil in the middle of winter without causing us to curtail the least bit in either power or heat," says Mr. Rockwell. Petro oil burners can save money for you too.

PETRO preheats oil for steady, sure firing

Cold oil is sluggish, starts slowly, and burns irregularly so the makers of Petro adopted the "thermal viscosity principle" of *preheating oil* to an efficient temperature before it is injected into the firebox. This makes possible fast starting, steady firing, and lower fuel costs.

PETRO burns lower cost fuel with complete reliability

The pre-heating of oil enables Petro owners to burn the heavy fuel oils (Nos. 5 and 6), which average 8% richer in heat value than light burner oils, and cost less per gallon. Petro burners are completely automatic, and accurately take care of fluctuating load requirements.

PETRO is adaptable to any boiler room

Petro industrial oil burners are designed and built to *modernize* the firing of your present boilers. The flame is adjustable to any firebox, and the installation is adaptable to any boiler room layout. This means that you save substantially on initial installation costs, and more money every day on fuel and labor costs. Mail coupon or write for free catalog and information.

Circle 517 on Reply Card for more data

letters

. . . from readers

Leaks?

Sir:

In reading the December 1954 edition of INDUSTRY AND POWER, I noticed a write-up on a plastic pipe patch on page 6. We are quite interested in this and would appreciate your forwarding to us more data, including manufacturers.

W. E. McCardell, Jr.
"Automatic" Sprinkler Corporation of America

—This patching material is still in the experimental stage at a U.S. Navy laboratory. Celanese Corp. of America, 180 Madison Ave., N.Y. 16, produces a polyester laminate for this use.

Voltage Control

Sir:

During the last World War, I was retained to design and direct the installation of the power system for a plant that was being enlarged to provide increased output for naval vessels. Maximum output had to be maintained while the new system was being put in the plant. The main distribution circuit breakers were being overloaded. We fortunately had obtained delivery of rectifiers intended for the new system. When an existing circuit breaker's insulating gum around its terminals began to bubble, we connected one of these capacitors across the terminal and stopped the bubbling. It was a good example of a capacitor correcting the power factor of the electrical load and it saved the existing breakers.

An automatic, step type voltage regulator was built into this 5000 kva entrance transformer tank. This regulator maintained the lamp voltage at the load center within ±2 percent of normal.

Henry D. James
Consulting Engineer
Pittsburgh, Pa.

Films

Sir:

In the Jan., 1955 issue of INDUSTRY AND POWER you listed two sources of films that were available. If possible we would appreciate receiving a list of these and any other films that are available and information on how to obtain them.

Jerome V. Klazura
Engineering Department
Kellogg Co.

—I&P has a list of film sources available on request to the editor.

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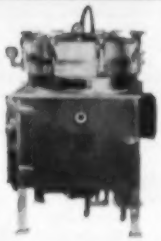

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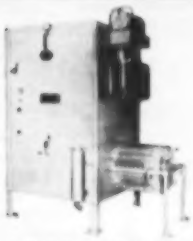

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new bulletins

. . . catalogs from leading manufacturers

200—Controls

The Gotham line of indicating, recording, and controlling instruments is summerized in four-page bulletin GL-1. Included are photos and descriptions of industrial thermometers, recorders for pressure, temperature, and humidity, and portable running time-temperature recorders. United States Gauge Div., American Machine and Metals, Inc.

201—Control Valves

Three basic types of single seated diaphragm control valves are discussed in 15-page bulletin 5304. Cut-away views and charts with complete specification data make this a good reference book. Leslie Co.

202—Temperature Regulators

Temperature control by means of temperature regulators that combine both a pressure and thermal element is discussed in four-page folder 1008. Installation drawings point out how the Spence Type ET150 regulator can be used with an instantaneous water heater, a storage water heater, and a forced warm air heating system. Spence Engineering Co., Inc.

203—Rotary Pumps

Rotary Liquid Pumps — their operation and advantages — are described and pictured in four-page bulletin L-54. Cross sections and flow diagrams are included for both rotating plunger pumps and Heliquad rotary pumps. Kinney Manufacturing Div., New York Air Brake Co.

204—Blowdown Control

Determination of the rate of boiler blowdown and selection of a correctly sized heat exchanger are made possible with use of simplified chart JPC, based on total dissolved solids in boiler water. Also given are recommendations for selection of blowdown equipment in accordance with normal operating conditions of the boiler installation. Henszey Co.

205—Rapping

A system of continuous, intensity controlled rapping for Cottrell Electrostatic Precipitators is discussed in six-page bulletin. Included are schematic diagrams of the rapper, an explanation of its basic operating principles, illustrations of components, and summary of its features. Research-Cottrell, Inc.

206—Transformers

Types 136 and 236 Powerstat Variable Transformers — design, new ratings, and performance — are discussed in eight-page bulletin P384. The complete standard line of single and three phase assemblies, provided for manually-operated and motor driven duty in 120, 240, and 480 v ratings, are shown in photographs and drawings. The Superior Electric Co.

207—Oil Unit Heater

Commercial heating by means of the Delta direct fired oil unit heater is discussed in four-page bulletin UH. Drawings point out means of installation for various applications such as in concealed interior walls, free hanging, and where multiple unit piping arrangements are necessary. Delta Heating Corp.

208—Pumps

Controlled capacity pumps and liquid proportioning equipment designed to meet first cost, operating, and maintenance objections of pump users in the field are discussed in 15-page bulletin S-1254. Included is a photo of each pump with a short description of its capacities and applications. Application charts give further information. Philadelphia Pump and Machinery Co., Inc.

209—Quenching Oil

High thermal stability and high boiler range of Sun quenching oil No. 11 is pointed out in data sheet 39. Applications listed include use in quenching systems where a high flash point oil is required and for bright quenching from controlled atmosphere furnaces. Sun Oil Co.

210—Rust Control

Problems relating to surface preparation and application of rust inhibiting products are given in 23-page general catalog 254. Application photos are used to show how each type of product is used along with color chips of the colors available. Rust-Oleum Corp.

211—Conveyor Belt Design

Engineering data for standard conveyor belt construction is shown in color on this chart for eight of the most popular ply and material combinations. It shows theoretical ultimate strength, actual ultimate strength, fastener strength, operating strength with fasteners and with splice, and troughing index. A separate data sheet is included. Quaker Rubber Corp., Div. of H. K. Porter Co., Inc.

212—Valve Problems

Questions raised at valve clinics held by this company have been incorporated into a 17-page bulletin which lists questions and answers designed to help in the selection of materials, data on new materials, service and installation problems, as well as information on valve repair. Copper Alloy Foundry Co.

213—Solenoid Valves

If you use direct operated solenoid valves for automatic or remote flow control of liquids and steam up to 400 F, or of high viscosity liquids you will want to read 11-page bulletin V-2. Normally closed, normally open, explosion-proof normally closed, and three way valves are shown in cross-sectional drawings with tables of sizes and dimensions. The Johnson Corp.

214—Vertical Pumps

If vertical units are the best solution to your pumping problems, nine-page bulletin 7096 will help you select the vertical multi-stage pump you need. Sectional drawings, specifications, and installation views of various types of pumps in service are included. Ingersoll-Rand Co.

215—Magnet Wire Catalog

Bulletin C-79-12A is a pocket-sized edition of the large magnet wire catalog (C-79-12). It is indexed, and includes charts, tables, drawings, and photographs. Anaconda Wire & Cable Co.

216—Pilot Operated Valves

Self-contained internal pilot operated solenoid valves with forged brass body and bonnet and Hycar diaphragm are described and pictured in four-page folder 708. Applications listed include instrumentation, refrigeration, lubrication, spraying, and machine tools. Cut-away drawings are labeled to show design features. Automatic Switch Co.

Lighting Standards

"RLM Standard Specifications for Industrial Lighting Units, 1955," includes the new, higher specifications for both incandescent and fluorescent industrial lighting units effective October 1, 1954. **RLM Standards Institute, Suite 818, 326 W. Madison St., Chicago 6, Ill.**

217—Demineralizing Handbook

"Handbook on Demineralizing," 40-page bulletin 5800-B, compares various methods of water treatment and compares demineralizers and evaporators. It goes into characteristics of various types of available cation and anion exchange materials and offers data on operating costs. Cochrane Corp.

218—Bin Level Control

Changes in the design of the high duty Tellevel bin level control are explained in four-page bulletin 110. The redesigned switch housing and deflector mechanism are shown in drawings as well as means of mounting unit for standard and special applications. Stephens-Adamson Mfg. Co.

219—Distribution Transformers

"Allis-Chalmers Protected Distribution Transformers," eight-page bulletin 61B-7309B, tells how these transformers help the utility. Operating advantages of the transformer, available in ratings of 3 through 100 kva, 2400 to 14,400 v, and mechanical data on five type designations are also given. Typical load-time curve for one of the units shows how the integral breaker increases useful capacity. Allis-Chalmers Mfg. Co.

220—Ramming Mix

"Ramset—New and Unusual Applications," four-page folder D-101, discusses new uses of this magnesia ramming mix,

NOTE — Each new bulletin item has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 74/75.

Are you paying for soft water you don't get?

Are you attempting to "get by" without a water softener or with one that is not delivering the quantity or quality of soft water you need? If so, the toll of hard water is far exceeding the cost of an efficiently operating water softener unit. You are paying for soft water without getting it, and you can't afford not to have a water softener.

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More than a dozen different arrangements of valve designs and operating methods are available to you in the complete Everlasting line of boiler blow-off valves for operating pressures up to 600 psi. Here is a range of selection from which you can get exactly the combination you wish.

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new bulletins

—Starts on page 28

designed for original bottom construction and maintenance of open hearth and electric steel producing furnaces. Basic Refractories, Inc.

221—D-C Motors

Examples of the practical applications of the new Super T line of d-c motors with dynamic response are given in 11-page bulletin C-2002. Speed range, speed and rate of acceleration, and construction of these motors are discussed. Reliance Electric and Engineering Co.

222—Strainers

You can prevent rust, scale, and dirt from clogging steam equipment with use of Yarway fine-screen strainers, according to six-page bulletin S-204. Tables give prices, rates, dimensions, and woven screen data. Flanged strainers, made to order only, are described briefly. Yarnall-Waring Co.

223—Glass Blocks

"How to Modernize Old Windows with PC Glass Blocks," seven-page bulletin GB-104 points out that glass blocks have greater insulating value than sash windows, provide better daylighting, and are easier to clean and maintain. Drawings show how blocks will fit any existing window opening. Pittsburgh Corning Corp.

224—Steam Traps

Two new traps for medium drainage jobs are described in one-page bulletin 1403: the No. IX standard trap, and the No. IXB blast trap. Table gives specifications for this company's complete line of Rotating Valve bucket traps for maximum operating pressures of 125 to 250 psi. H. O. Trerice Co.

225—Jet Syphons

Steam and air jet syphons—their application, construction, operation, and performance—are described in 23-page bulletin 2-A. Tables on suction capacities, steam consumption, and operation pressures, along with flow diagrams and cross sections make this a good piece of reference literature. Schutte and Koerting Co.

226—Pipe Couplings

Malleable pipe coupling and fittings for petroleum, mining, sprinkler systems, and general industrial use are shown in 16-page folder CF1054-10. Photographs and text point out savings in time and labor possible with use of Rolagrip couplings for plain end pipe and Gruvagrip and Gruvajoint couplings for grooved pipe. Gustin-Bacon Mfg. Co.

227—Fluorescent Lamps

"Fluorescent Lamps and Auxiliary Equipments," eight-page technical bulletin LS-101, gives complete data on the Circline, general line, Slimline, and rapid start lamps. Wiring diagrams, equipment for each type of lamp, and equipment for

suppression of radio interference are included. Application Engineering Dept., Lamp Div., General Electric Co.

228—Water Tube Boilers

Water tube package boilers, known as the Compak line, are described in seven-page booklet 5000. Design and construction features are shown in cut-away drawings with a list of standard equipment, optional equipment, and a graph of performance curves. International Boiler Works Co.

229—Industrial Fans

Engineers and designers interested in quick, accurate selection of industrial fans for required capacities will find 27-page bulletin EX-531 a useful, timesaving tool. The catalog introduces the type EX industrial fan, a medium speed, air and materials handling unit. Bayley Blower Co.

230—Displacement Pumps

A new kind of packless, positive displacement pump for metering flows from 5 cc to 6 gal per hr per feed is described in six-page bulletin AP-84. Sectional drawing of this Hills-McCannameter shows nomenclature of parts and fluid flow within the pump. A complete description of operation is included. Hills-McCanna Co.

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231—Liquid Chillers

The wide selection of packaged liquid chillers available from this company for air conditioning and industrial application, sized from 7½ to 150 hp, are presented in 15-page bulletin C-1100-B52. Application photos show the units in operation for chilling water, brines, or other liquids, and compressed air. Worthington Corp.

232—Hot Process Softeners

"Hot Process Water Softeners," seven-page booklet 801, includes data on hot process softeners and hot zeolite softeners. Flow diagrams, installation photos, and descriptions of each component of the systems are included. American Water Softener Co., Inc.

233—Air Pollution

"Stop Air Pollution with the Liquid Precipitator Multiple-Action Scrubber," four-page booklet LH12054, tells how to control dusts discharged from stacks of cyclones, rotary dryers, kilns, roasters, mixers, pulverizers, and sintering plants. Operating principles are explained in detail. Johnson March Corp.

234—Dust Control

"Dust and Fume Control," 11-page bulletin G406, tells of the improvements and refinements that have been made in electrostatic precipitation since the first Cottrell precipitator was erected. Also included are background material and illustrations of the Multiclone mechanical dust collector, the CMP unit—a combination Multiclone and Cottrell unit, the Dualaire dust collector, and the Holo-Flite processor. Western Precipitation Corp.

235—Insulation

"Aerocor Insulation," eight-page bulletin GL6.C4, is a complete index to all Aerocor insulations. It lists in tabular form each type along with its suggested uses, application methods, sizes, and performance. Owens-Corning Fiberglas Corp.

(Continued on page 76)

Titusville Type WTP WATER TUBE
Steam Generators

This famous power package is shop-assembled, shipped complete with all components installed, and occupies a minimum of space in the plant. You couldn't ask for a more efficient, dependable and simple-to-operate unit—as you'll agree when we give you the details! Let us have your requirements, without obligation.

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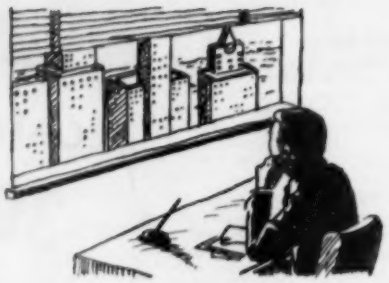
Out Our Window



A Need For Better "Foundations"

THE BUSINESS ECONOMISTS and statistical experts have been so impressed with the optimistic outlook for consumer sales they seem to have overlooked one important aspect of our economy. According to the best figures available from the Department of Commerce and according to our own observations, all too little money is being spent on the replacement of obsolete, basic industrial equipment — as opposed to production equipment. The engineer in charge of over-all plant operations well knows that it is necessary for his basic equipment to be in good condition if the plant, as a whole, is to operate efficiently. But it is hard for him to convince the top management (who are primarily interested in production and sales) that new basic equipment is needed for the plant.

There is a textile mill, in South Carolina, where something over $2 million was spent last year in modernization. The expenditure was long overdue, and it had become a question of spending the money or getting out of a highly competitive business. When the engineer turned in his proposals and specifications for modernization, he included a sound percentage of the total for purchase of the basic equipment — boilers, air compressors, lighting, and air conditioning. He allocated the larger percentage to the purchase of production equipment such as looms, spinning frames, slashers, and carding and opening machinery.

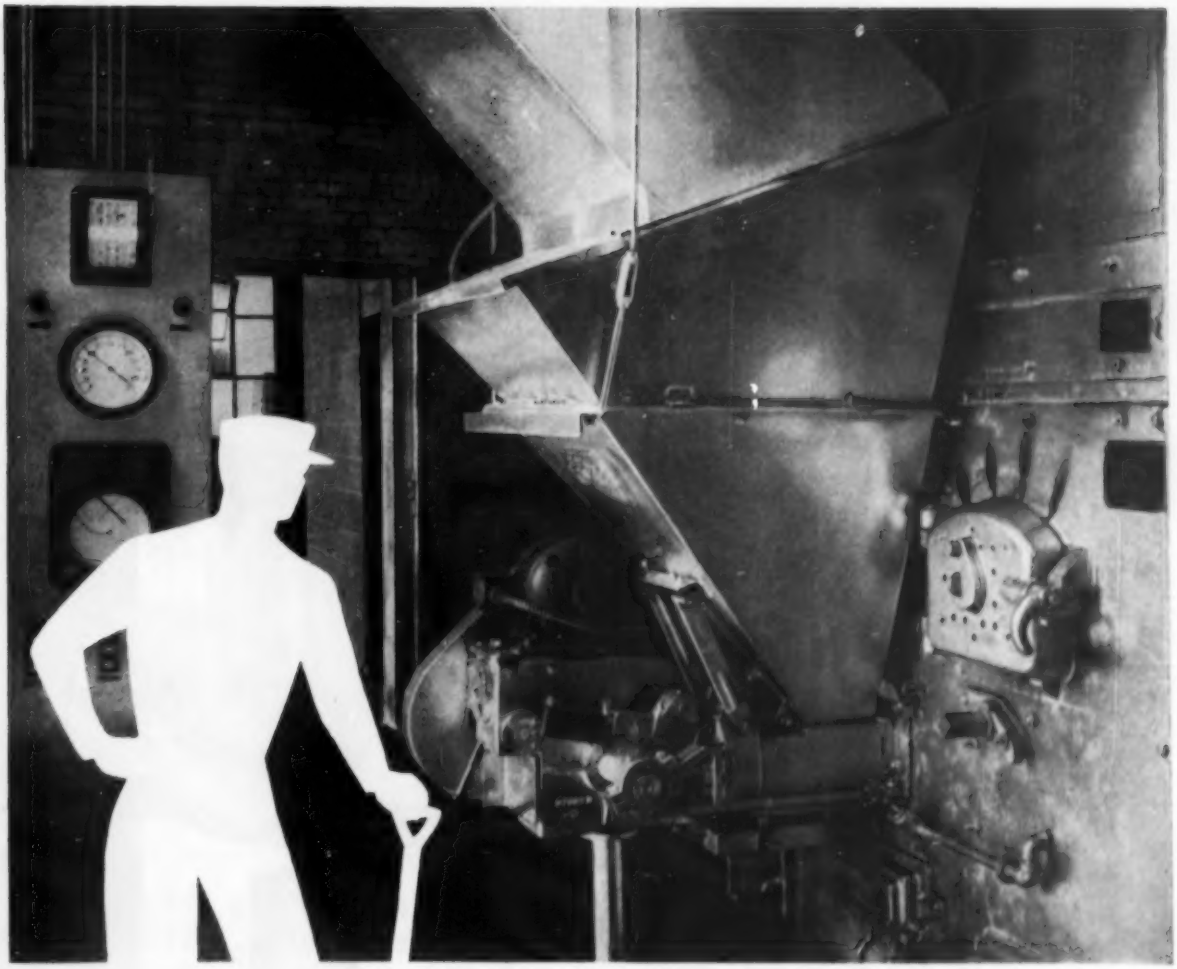
Top management, in this firm made up primarily of sales executives, took the engineer's proposals and spent two months revising them. The result was the expenditure of the same amount — $2 million — but it was all for production equipment except for $20,000 for new humidifier heads for the weave room and some extra lighting. The boiler, air compressors, new air conditioning system, and most of the lighting proposed by the engineer were by-passed. Despite all the pleas of the engineer, this revised plan was adopted. The mill now has increased its output of cloth, it proudly shows off its new Saco-Lowell spinning frames, and the production and sales personnel are pleased as punch. That is, they were pleased until the cost figures came in for the last quarter of 1954. Then, they were surprised to see that their production costs per yard were still out of line with their better competitors.

The engineer was able to give them the answer. They had built a modern mansion on a rotted foundation. All of their production equipment depended upon the plant utilities for efficient operation, and the utilities were unable to meet the demand in an economical manner. The boiler is a 1902, hand fired unit that takes the constant attention of four men. With a new boiler they could have eliminated three attendants and put the fourth man to work 80 percent of the time on other jobs. Coal handling is strictly manual and costing far more than it should. The fuel bill is way out of line. The compressors were built before the Chicago Fire. Air delivered to the plant is full of moisture, and the compressor is down three days out of the month for maintenance. The air conditioning system, if so it can be called, is simply a group of humidifier heads largely under manual control, and the water used is not treated, so the heads clog on a regular schedule, and droplets of rust filled water occasionally fall onto the cloth being woven. The lighting level in the spinning room is a constant 18 footcandles.

After all of their expenditures, the mill now must face a situation very similar to that prior to modernization. They have, it is true, a higher output, but their competitive position is even worse, for they cannot sell their increased production until they can bring costs down. Now, they must invest in modernization of basic equipment or close up shop. This is not a lone example. In the course of a year we go into many plants, and almost all of them are ready to show you their production equipment. Then, with a soft apology, they hurry you past the basic industrial equipment—the foundation on which plant efficiency must be built.

The plant engineer for a large motor manufacturer took us through his plant last year, showing us all the excellent machine tools, special winding and assembling equipment, and paint shops. "Funny thing," he said, "it's hard to believe, but we have the wrong size motors on about 60 percent of those machine tools." They made motors, but they never had got around to studying the loads on each of their machine tools and fitting motors to the jobs.

There is no question; our industrial plants are not in as good shape as they look to a hurried observer on a plant tour. The foundations are rotten. It is time that the plant engineer took top management men by the hand and led them down into the power plant for a look at the boiler, the pumps, the air compressor, and the heating and cooling equipment. As well built as this type of equipment is, it will not last forever. And the new models offer new highs in efficiency that will show up in better production at lower cost throughout the whole plant. It is time to spend more on the "foundations."



The case of the missing fireman

There is no fireman in the boiler room of the Scandinavia Belting Company plant at Charlotte, North Carolina. There is nothing for one to do. Coal handling is completely automatic, and because this operation is enclosed, there is little cleaning to be done.

It takes only two hours a day to make the necessary checkups, dispose of ashes and keep everything in the apple-pie order you see.

With automatically controlled combustion, operating efficiency is so high as to show a substantial fuel saving.

Bituminous coal was chosen for this modern plant because a fuel evaluation study showed it would be the most economical and at the same time give maximum cleanliness and utmost convenience.

The Chesapeake and Ohio Railway's fuel service engineers will be glad to give you similar technical assistance in choosing the best fuel and equipment for your purpose and locality.

COAL...Fuel of the Future

Chesapeake and Ohio Railway

Coal Traffic Department, 2104 Terminal Tower, Cleveland 1, Ohio

WORLD'S LARGEST CARRIER OF BITUMINOUS COAL

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IT FLOATS ON THE LOAD!*

You turn on the steam.

This little stainless steel valve—the only moving part in the Yarway Impulse Steam Trap installed on the equipment—opens wide and *stays* open as the air and condensate continuously pour through.

The equipment reaches production temperature in the quickest possible time.

Production temperature reached, the little valve snaps shut. After that, by a pulsating action, it discharges all condensate as it forms—even a tiny teaspoonful. *There's hot steam in the equipment all the time . . .* steady, maximum temperatures are maintained.

It all adds up—to more production per day.

Other profit-making features of the Yarway Impulse Steam Trap—low initial cost, easy installation, stainless steel construction, low maintenance, good for all pressures, quick delivery from over 200 local industrial distributors.

Try a Yarway—free for 60 days—and *prove* its advantage. Your distributor will supply you.

For free Yarway Impulse Steam Trap Bulletin T-1740, write . . .

YARNALL-WARING COMPANY
109 Mermaid Ave., Philadelphia 18, Pa.

*. . . *resulting in fast heat-up of equipment, more production per day.*

YARWAY | *impulse steam trap*

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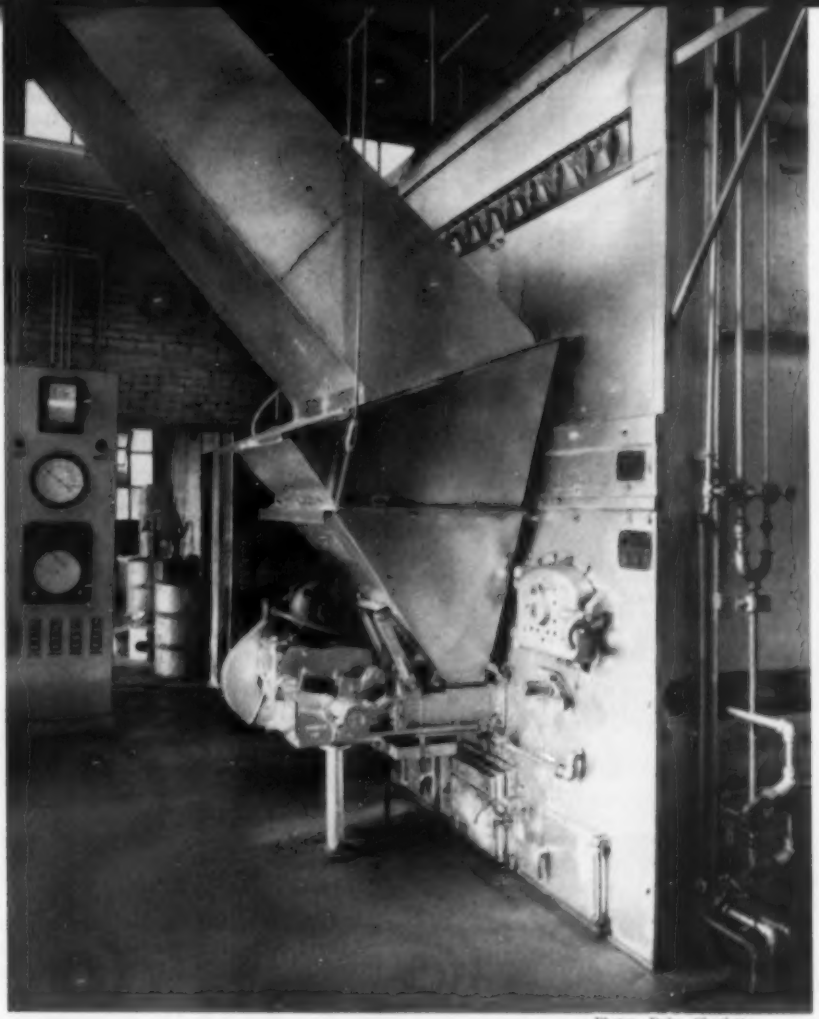
the ever increasing demand for more



Photos—Duke, Charlotte

Front angle view of firing aisle shows the new steam generating unit, underfeed stoker, coal storage hopper, and panelboard containing the indicating light type pushbuttons and the instruments for the boiler.

"Big plant" auxiliaries and modern coal firing make this small, field erected boiler a guide to getting . . .

I&P EXCLUSIVE

More Steam for Less Money

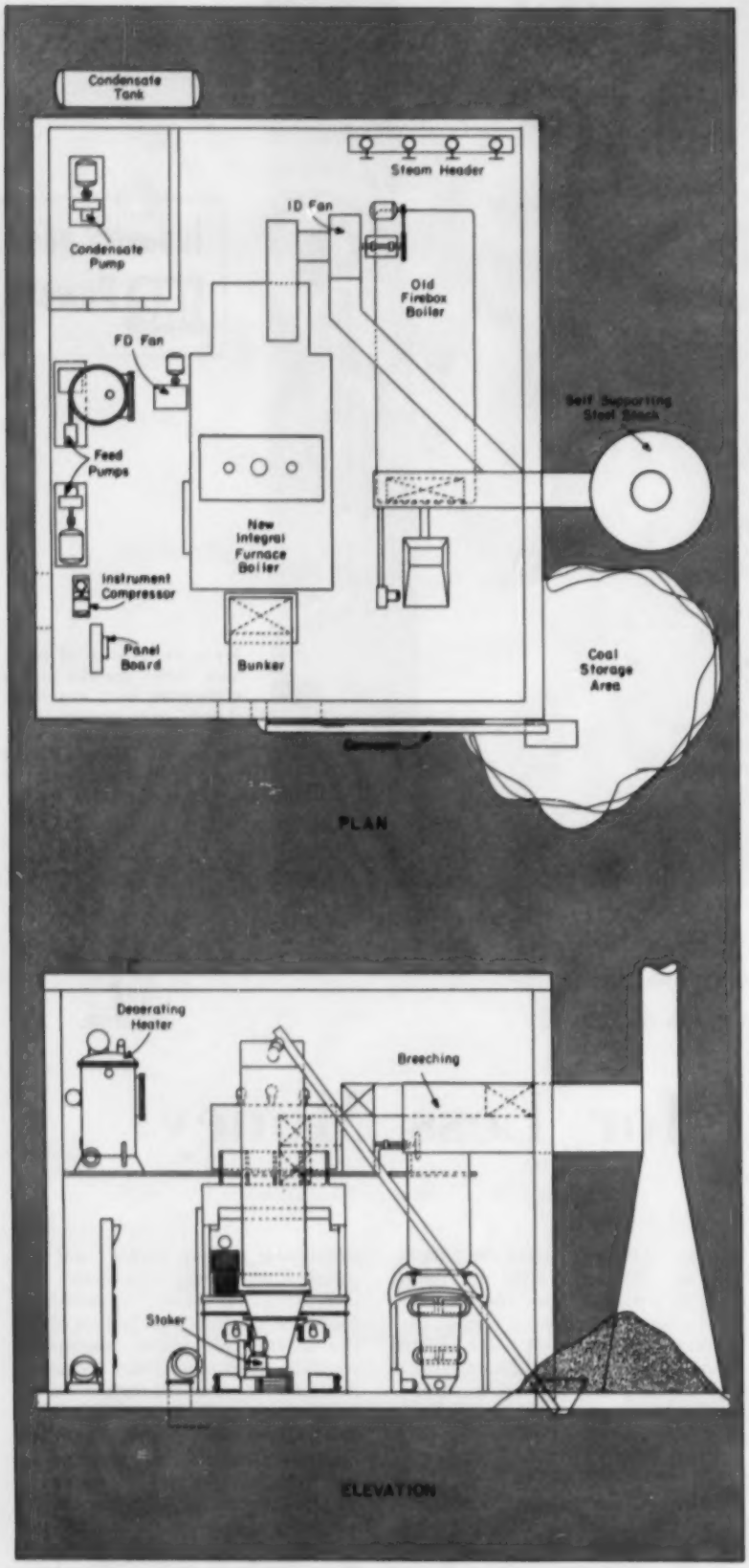
J. G. BOLTON, Plant Engineer
Scandinavia Belting Co.

SCANDINAVIA Belting Company's new coal fired boiler plant is unique among small industrial installations. One new steam generating unit, installed in the same floor space previously occupied by an old firebox boiler, has increased plant capacity 150 percent, provided ample reserve for anticipated load growth, reduced fuel costs 15 percent in addition to increasing plant process efficiency, and cut labor costs 70 percent. These results were accomplished at nominal capital expenditure by intelligent selection and arrangement of the equipment to assure continuously efficient performance with minimum operating supervision and maintenance.

Major Components

Although the present maximum steam demand is only 4600 lb per hr, this new plant includes: a modern field erected integral furnace water tube steam generator; a heavy duty underfeed stoker; forced and induced draft fans; automatic coal conveying equipment, actuated by fuel level controls in a hopper above the stoker; pneumatic combustion controls; instruments; and feedwater flow and temperature regulators. All components are carefully integrated, and the entire installation is neat and clean. In fact, the sealed handling and firing system completely eliminates coal dust in the boiler room.

Formerly, this plant operated two firebox boilers fired by light duty type underfeed stokers. These boilers became badly overloaded with



Plan and front elevation drawings of the Scandinavia Belting Co. boiler plant.

the ever increasing demand for more steam. Fuel was handled manually, and efficiency was low. Boiler room personnel removed eight wheelbarrow loads of ashes (including some unburned coal) each morning, and eight to ten wheelbarrow loads each evening. Since the boilers were overloaded, the steam pressure fluctuated, and frequently wet steam was delivered to dryers in the plant. This lengthened production time, overworked the steam traps, made maintenance excessive, and caused generally intolerable conditions.

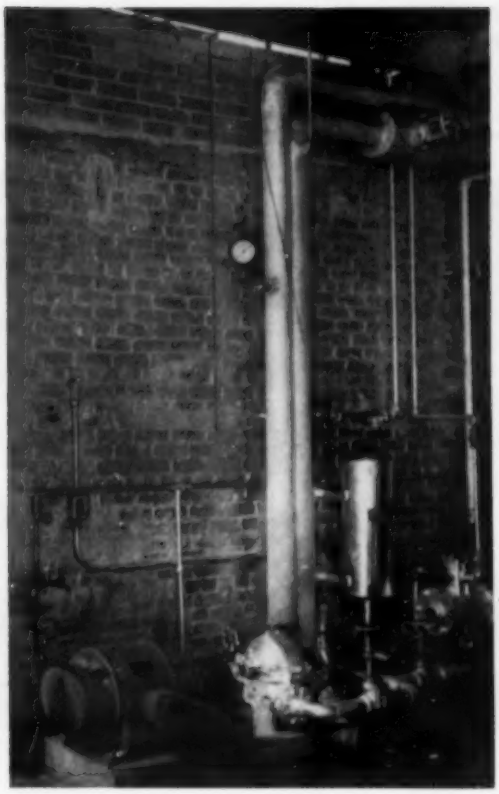
During the design stages of the project a careful analysis was made of the operating results of similar plants using lower investment equipment with less expensive auxiliaries and controls. This study revealed an important fact — the cost of fuel over the life of the equipment would be anywhere from 4 to 10 times the price of the boiler and stoker equipment complete with controls. Therefore, an appreciable savings in fuel consumption during this period would be a substantial item, and flexibility in fuel selection would be important.

Fuel Evaluation

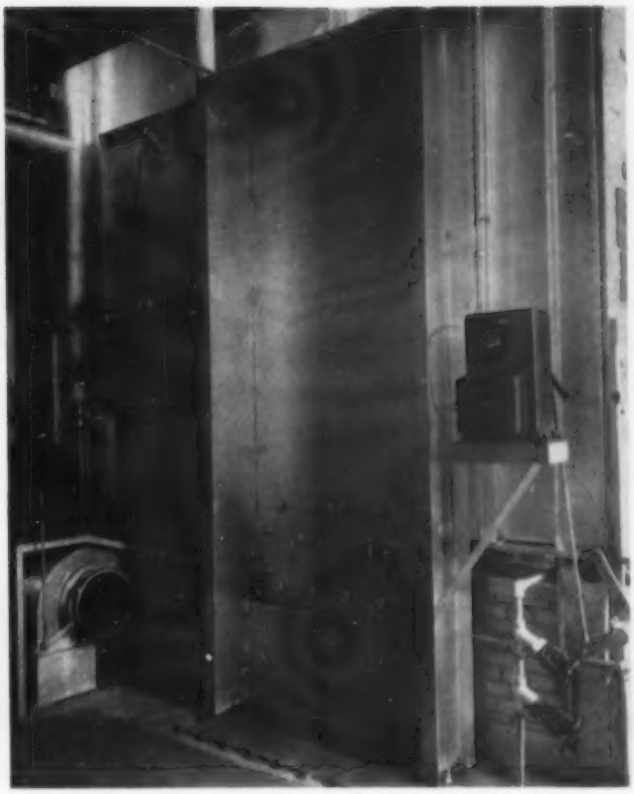
Evaluation studies of all available fuels in the Charlotte, N. C. area indicated the new unit should be designed principally for bituminous coal firing. Oil was considered, but the comparison with coal showed that it is too expensive at present. While gas is becoming an important auxiliary fuel in this part of the country, at the time of the installation it was not available for steam plant use. However, to assure complete flexibility, including the possibility of taking advantage of an attractive rate on gas on an interruptible basis, provisions were made to permit future installation of gas and oil burners without removing the stoker — an unusual feature for a plant of this size.

Boiler

The boiler selected is a water tube unit with fully water cooled, integral furnace of special design, fired by a single retort type heavy duty stoker with automatic coal feed. This construction will permit the addition of gas and oil burners in the furnace sidewall without removing the stoker and will provide high efficiency on coal, gas, or oil. Design pressure is 200 psig, and the capacity is 7350 lb of steam per hr continuously and 7800 lb per hr for a two hour peak. The setting is fully insulated and covered with a heavy steel casing, including metal lagging over



The new motor driven centrifugal feed pump has ample capacity for future operating conditions.



Left side view of boiler shows FD fan with control unit, frame for future gas or oil burner windbox, and stoker control drive.

the drum insulation to provide protection and minimize maintenance.

Coal Handling

Coal handling is completely automatic from the outdoor storage area to the furnace — the only manual labor required being periodically loading of a ground level hopper. Sealed conveyors terminate at a bunker with 4 to 6 hours gravity storage that is installed above the stoker, and level controls in this bunker operate the handling system. When coal drops to a predetermined low position, the controls start the coal conveyor motor. After the hopper is filled, upper limit controls automatically shut down the conveying system. This entire operation takes place without any attendance by an operator.

Ashes still are handled manually, but the total accumulation is only one wheelbarrow load in the morning and about 1½ loads in the evening. In fact, this installation proves that with modern equipment the ash handling problem in a plant of this size is negligible. The ash pit is equipped with water sprays for wetting down the ashes to minimize dust, and the operator sweeps the floor after the ashes are removed.

Although the existing stack would draft the boiler to the present 4600 lb per hr maximum load, the smoke abatement ordinance of the City of Charlotte necessitated the installation of an induced draft fan. This unit has air cooled ball bearings, and it is driven by a constant speed motor through a V-belt drive. Volume control of gas flow for furnace draft regulation is obtained by positioning an outlet damper, while primary air flow is controlled by inlet vanes on the forced draft fan.

Combustion Controls

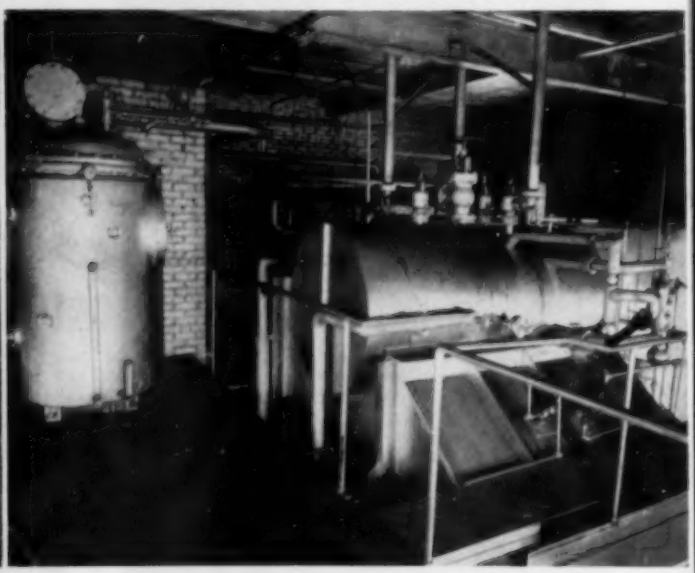
Combustion controls are of the pneumatic type and include separate control drives for coal feed, primary air flow, and furnace draft. The panel contains draft gages, an automatic pressure recorder, and indicating light type pushbutton stations for the stoker, forced draft fan, induced draft fan, deaerating heater pump, and feedwater pump. All of the equipment is rugged and of simple design, and routine attendance, such as cleaning and adjusting, can be handled by relatively unskilled help. Highly skilled personnel are relieved of routine boiler maintenance and can concentrate on the important problem of sustaining maximum production to keep profit level high.

Principal new items in the feedwater system include a centrifugal pump, a deaerating heater, and a thermohydraulic feedwater regulator that provides steady water level over a wide range of loads. The entire system is designed with adequate capacity for future operating conditions in the event higher pressures

Closeup of valve-in-head soot blower.

Left. The coal conveying system is operated automatically by high and low level controls in the hopper above the stoker.

Below. Platforms near the top of the boiler provide access to the deaerating feedwater heater, steam header, and ID fan.



become desirable. For example, the feedwater pump has a rated discharge pressure of 250 psig, although a smaller impeller is now in use that develops 190 psig.

Condensate Return System

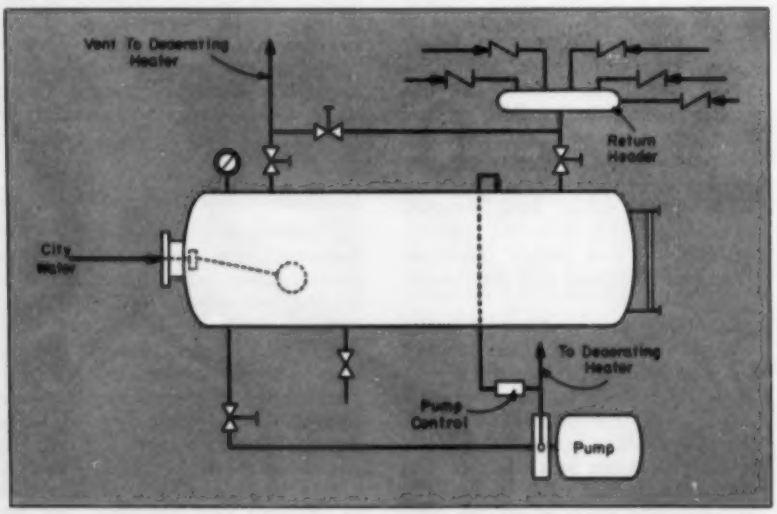
In addition, a carefully designed condensate return and makeup system (see drawing) is installed. Conservation of returns wherever possible eliminates waste and minimizes makeup requirements. Raising the temperature and deaerating the makeup at this point in the system also offers assistance to the primary deaerating heater. The arrangement gives very satisfactory results and provides effective heat recovery.

Piping changes, in addition to the feedwater system, include a new steam header with convenient access to all distribution valves. Although most of the equipment is arranged for single level operation, a system of platforms provides accessibility to higher level major auxiliaries. This saves time and labor in making inspections or doing routine maintenance work. As further insurance, a trench with cover plates is provided in the floor so gas or oil lines could be installed if these fuels should prove economical at any future time. This required a small additional expenditure, but was considered a wise investment.

One important factor for the morale of employees in this plant is cleanliness. It has been demonstrated effectively in many plants that if all equipment and the boiler room itself is freshly painted an attractive color, the personnel take greater pride in their job and give the equipment better attention. This entire plant is painted with aluminum paint, and the control panel, instead of being the conventional black, is an attractive pearl grey finish, making the instruments in their black cases stand out effectively.

Supervision

Actually, there is no fireman for this boiler. An attendant, who does other work about the plant, is given the responsibility of checking on the boiler at regular intervals. This is



Drawing illustrates the general arrangement of the condensate return system.

Fig. 1 — Three methods of grounding

necessary in any boiler plant regardless of how much automatic equipment is installed. However, by checking the pressure recorder and indicating light type pushbutton stations, the attendant can tell at a glance what equipment is in operation and if the boiler is delivering rated pressure. Under normal conditions, the total daily attention for all services is only 2 hours per day.

Operating Results

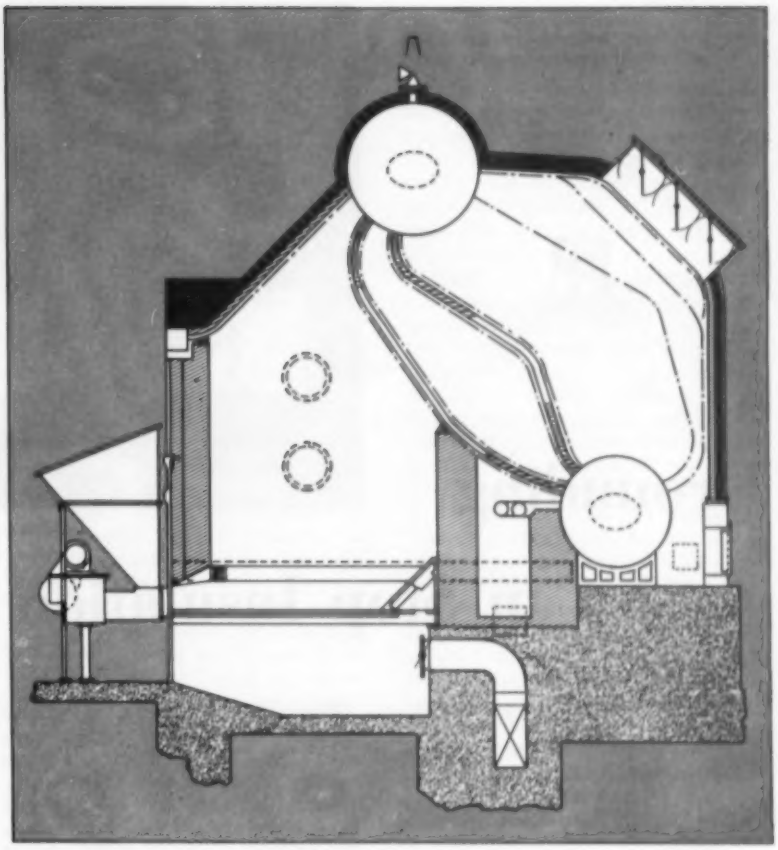
Operating results since placing the plant in service have been most gratifying. Initially the engineers had contemplated increasing the operating pressure from 100 to 125 psig when starting up the new unit to improve the efficiency on dryers in the plant and to eliminate the wet steam problem. However, it was discovered that the cyclone separators in the drum of the new boiler delivered dry steam, and the operating pressure was maintained at 100 psig to avoid the necessity of resetting controls throughout the plant. Efficiency on the dryers now is much higher, quality control is easier to maintain with dry steam at steady pressure, and drying time on certain operations has been reduced.

Fuel Analysis

Plant personnel also found that improved performance resulted from use of a 1¼ x ¼ in. stoker-nut coal (instead of a nut and slack) of the following analysis (dry basis):

Fixed carbon	57.18%
Volatile	38.08%
Ash	4.74%
Total	100.00%
Sulfur	.64%
Fusion temperature	2700 F
Btu per lb	14,467

This stoker-nut coal is double screened, which eliminates the fines. As a result, the fuel bed is more uniform, and there are no coal fines to work through the grates of the stoker into the windbox. Maintenance is simplified, and fuel efficiency is consistently high.



Sectional side elevation at the centerline of the steam generator and stoker.

Benefits

With a dependable steam supply at steady pressure, plant production has improved in both output and economy, and fuel savings of 15 percent have been realized. In addition, the boiler features the ability to burn coal, or in the future, oil or gas in a single furnace without removing the stoker. Thus, should the fuel market change in the future, Scandinavia has the insurance that at a nominal expenditure for only the burning equipment, conversion to gas or oil can be accomplished without sacrificing coal firing. Labor savings provide additional benefits.

PRINCIPAL EQUIPMENT

Boiler	The Babcock & Wilcox Co.
Boiler setting	Piedmont Products Co.
Underfeed stoker	Detroit Stoker Co.
Coal conveying system	Baughman Manufacturing Co., Inc.
Coal bunker level controllers	Bin-Dicator Co.
Forced draft fan	Clarage Fan Co.
Forced draft fan motor	Allis-Chalmers Manufacturing Co.
Induced draft fan	Carolina Blower Co., Inc.
Induced draft fan motor	General Electric Co.
Air compressor	DeVilbiss Co.
Boiler feed pump	Worthington Corp.
Deaerating feedwater heater	Worthington Corp.
Feedwater regulator	Bailey Meter Co.
Water column, high-low alarm	Reliance Gauge Column Co.
Condensate return system	Scandinavia Belting Co.
Steam gage	Manning, Maxwell & Moore, Inc.
Steam header valves	Wm. Powell Co.
Steam reducing valves	Spence Engineering Co., Inc.
Safety valves	Manning, Maxwell & Moore, Inc.
Blowoff valves	Yarnall-Waring Co.
Chemical feed system	Scandinavia Belting Co.
Soot blower	Diamond Power Specialty Corp.
Combustion controls	Bailey Meter Co.
Electrical controls	General Electric Co.
Electrical contractor	B. F. Todd
Pipe and fittings	Industrial Piping Inc.
Insulation	Guy M. Beaty Co.
Metal lagging	The Guaranteed Water Proofing Co.
Boiler and equipment erection	High Point Boiler & Tank Co.
Engineering	J. O. Bolton

power for local use, most industrial systems are supplied by an electric

to about 60 to 100 percent of the three-phase fault-current value

of the phase leads plus one in the ground lead

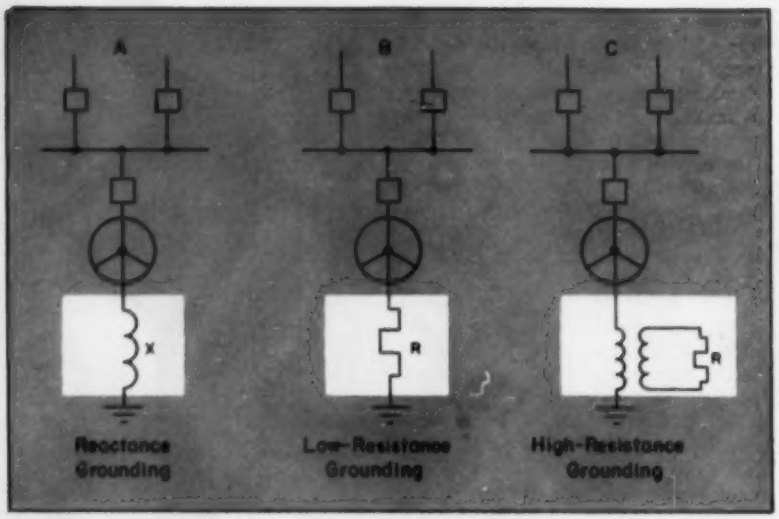


Fig. 1 — Three methods of grounding that will limit system overvoltages.

I&P EXCLUSIVE

Grounding Can Stop Insulation Failures

M. S. BALDWIN
Engineering & Service
Westinghouse Electric Corp.

INDUSTRIAL POWER system grounding has always been a controversial subject. Although there are arguments for and against grounding, it must be acknowledged that electrical equipment failures on industrial systems often have been reduced by the installation of suitable grounding equipment.

All too frequently, a plant engineer is harassed by a series of insulation failures that cause costly shutdowns and repair bills. The situation is frequently aggravated because two or more failures may occur simultaneously at different locations within the plant.

For example, a rubber mill and its associated processing machines were recently out of service because of insulation failures on the 2300-volt driving motors. In addition to the loss of production, the cost of restoring the equipment was an estimated $20,000 to $30,000. Within a six-month period, the failures occurred on eight pieces of electrical equipment. In every instance, two failures occurred simultaneously, and most of the equipment involved was essential to the manufacturing processes. In contrast, no failures have occurred since installing high-resistance grounding equipment.

Present-day industrial electrical systems have become quite extensive. Connected to them is a large number of motors and other equipment vulnerable to overvoltages. These overvoltages may be of power-system frequency or may be of a transient nature. Overvoltages of power-system frequency are usually caused by a conductor coming into accidental contact with one of a higher-voltage system, or by some resonant condition.

Transients

Transient overvoltages occur more frequently. They may be caused by lightning surges, opening of a switch or circuit breaker, operation of improperly applied current-limiting fuses, arcing due to accidental grounds, or to a number of other such common occurrences. The magnitude of these transient overvoltages on an ungrounded system can approach five or six times the normal power-frequency voltage crest. The insulation of most equipment connected to the system will not withstand these voltage levels. This is particularly true of rotating equipment and other kinds of air-insulated apparatus.

Proper grounding of a power system will limit the magnitude of transient overvoltages, from causes other than lightning, to 2½ to 3 times the normal power-frequency voltage crest. Since this value of voltage is below the test level for equipment used on industrial power systems, the grounding will be effective in minimizing the number of insulation failures that might otherwise occur. Surge protection equipment, such as arresters, limit the overvoltages caused by lightning striking incoming lines.

There sometimes is a considerable amount of reluctance to grounding. This is particularly true where a system has been operated ungrounded for a number of years, and where the manufacturing processes involved require the utmost in service continuity. It is true that there are some disadvantages to grounding a system, and these may outweigh the benefits to be gained in some cases. Certainly there are a number of things to consider when making a decision: whether or not a faulted feeder is to be relayed off, extent of damage at the point of fault, availability of a neutral for grounding, damage due to mechanical stresses, and modification of existing protective relaying and motor starters.

Common Methods

Methods commonly used to ground a generator, a transformer, or a system, (Figs. 1 and 2) will limit system overvoltages to a safe value if properly applied. There are, of course, other methods of satisfactorily grounding a power system in addition to these.

Though a large number of manufacturing plants generate their own

power for local use, most industrial systems are supplied by an electric utility through transformers whose primaries are connected to the utility distribution or subtransmission lines. Where the industrial power system is electrically isolated from utility systems, the operators can usually exercise their own prerogative in regard to a grounding method. In those cases where there is no electrical isolation between the industrial power system and the utility system, the utility company engineers must be consulted.

When applying any grounding scheme that makes use of a low impedance in the neutral circuit, consideration must be given to mechanical damage to equipment and damage due to burning at the point of the fault should a ground fault occur. Transformers may be solidly grounded (that is, with no intentional impedance in the ground circuit) without regard to mechanical damage to the transformer. But it will usually be necessary to insert some impedance in the neutral when grounding generators.

Current-Limiting Reactors

A current-limiting reactor (Fig. 1a) is frequently used in the circuit between the generator neutral and ground when there is no objection to immediate tripping of a feeder in case of a ground fault. But if the transient overvoltages are to be kept to a minimum voltage level, the impedance of the neutral reactor must be low, and should limit the single-line-to-ground fault current to about 60 to 100 percent of the three-phase fault-current value.

From the standpoint of limiting transient overvoltages on a power system, resistance grounding in some form or another is a very satisfactory solution. If low-resistance grounding (Figs. 1b and 2b) is used, the rating of the grounding resistor is usually selected to give adequate ground fault current for satisfactory protective relaying, while still limiting the possibility of damage to equipment should a fault occur. This value of fault current frequently turns out to be the order of full-load current for the generator or transformer, although there is a wide variation on existing installations.

No Neutral

A zigzag-connected transformer can be used to provide a neutral for grounding when no convenient neutral exists (Fig. 2c). If this system is to be used, and the transient overvoltages on the system are to be held to safe values, the impedance of the grounding resistor should be at least twice the impedance of the grounding transformer.

When low-impedance grounding is employed, existing protective relaying and motor starters on the system must be investigated and possibly modified. All motor starters connected to the grounded system should have an overload device in every phase to insure tripping in the event of a ground fault within the motor. The feeders on the system should be provided with overcurrent devices in all three phases or in two of the phase leads plus one in the ground lead.

In some cases, modification of the protective devices on a system may be quite costly because of the number of motor starters and protective relays on the circuit. This alone might tend to discourage low-impedance grounding. If this is the case, the high-resistance system of Fig. 2d can be used.

There is an increasing number of manufacturing processes that are severely hampered when a power system outage occurs. This is particularly true in the chemical industries. Sometimes a short outage on the power system compels starting the manufacturing process from the beginning, with a net loss of one or two days' production time. In such cases, it is important to avoid tripping of a faulted feeder if the feeder can be kept in service. Again, this need not prevent one from grounding.

The high-resistance grounding method shown in Fig. 2d can be used to limit the overvoltages on the system in the event of a ground fault while maintaining the faulted feeder in service, unless a second fault occurs on another phase. A protective relay may be used to sound an alarm so that the operators can take immediate measures.

Inexpensive

The grounding method depicted in Fig. 2d is an inexpensive, high-resistance scheme that has been successfully applied in a number of industrial plants. The method makes use of three standard, single-phase

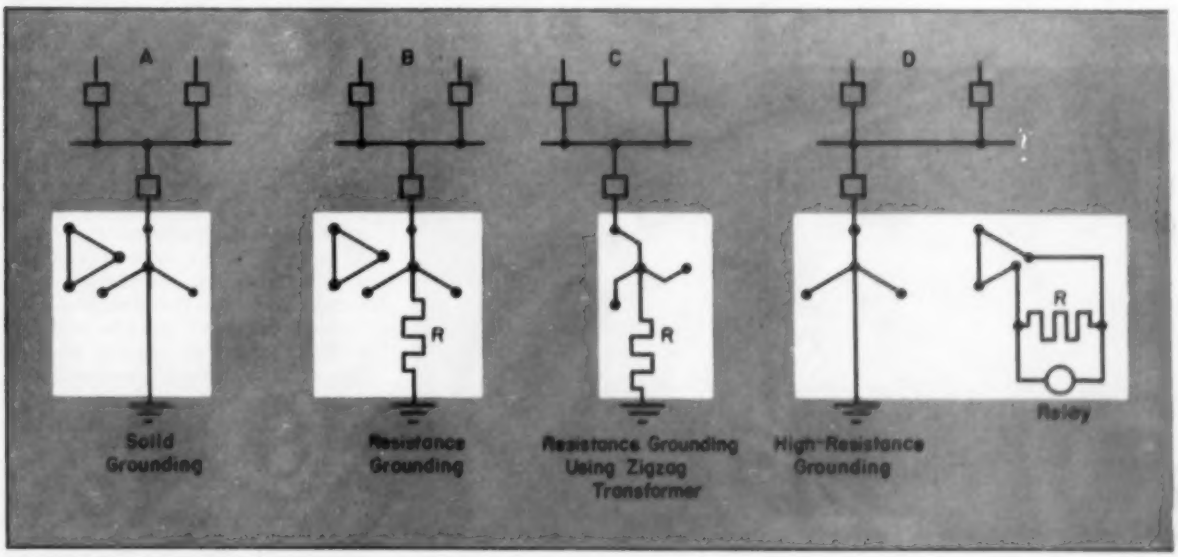


Fig. 2 — A variety of schemes, each having advantages of its own, is available for grounding industrial systems.

Fig. 3 — Inexpensive high resistance grounding scheme uses three standard single-phase transformers. Resistor is housed in the lower, ventilated base.

Fig. 4 — Box houses alarms. Ground fault turns on bell and light. The bell can be shut off manually but light goes out only when fault is cleared.

distribution transformers, the primaries being wye connected and solidly grounded. The secondaries are connected in broken delta, with a resistor inserted in the broken corner of the delta. A contact-making voltmeter is connected across the resistor and is used in an alarm circuit. The three small transformers and resistor in the lower portion of Fig. 3 are connected in this manner. The equipment at the top of the photo is surge protective equipment.

Fig. 4 shows a small cabinet containing the control devices of the alarm system of Fig. 5. A ground fault on this system causes a red light and an alarm bell to be energized. The alarm can be silenced by operating a pushbutton. The red light remains on until the ground fault is cleared, at which time the entire circuit is reset.

Voltage Ratings

The primary voltage rating of each of the single-phase transformers should be equal to the line-to-line voltage of the system. The transformer secondary voltage should be 120 volts. During normal operation, when balanced three-phase voltages exist on the primary system, the voltage across the resistor is substantially zero. When a ground fault occurs on one phase, the voltage across the resistor may go as high as 208 volts. By analog computer studies it was determined that the ohmic value and current rating of the resistor should be such that during such a ground fault, the power dissipated in the resistor will be equal to the charging or capacitive kilovolt-amperes of the distribution system.

Selecting the proper resistor rating is not difficult. If approximate cable lengths and sizes are known, a cable handbook will give the cable capacitances. If there are motors operating at the distribution system voltages, the surge protection for the motors in all probability will include some surge capacitors. These capacitors must be included when adding up the system capacitance to ground. In some cases, the cable capacitance will be small in comparison with surge capacitors. The charging kilovolt-amperes will then be equal to $2\pi fE^2_{ll}C$; where E_{ll} equals line-to-line voltage; C equals system capacitance to ground, including surge capacitors; and f equals the power system frequency.

Ratings

The resistor kilowatt rating will be as determined above. The voltage rating will be 208 volts. The continuous current rating will be that value

of current which corresponds to the above kilowatt and voltage ratings. Since each transformer secondary will have to carry the resistor current, each transformer should have a rating equal to the resistor current multiplied by 120 volts, that is: kva = I_r x (120/1000).

The system just described will limit transient overvoltages to 2½ to 3 times the normal voltage crest. There is very little to be gained by making the resistor and transformers larger than needed to make the resistor loss equal to the charging kva of the system. Some system growth may be anticipated when determining the resistor size. Beyond that, a larger resistor will only allow more fault current to flow. Since the faulted feeder will not be tripped off during a ground fault, this increased value of fault current would serve only to increase the possibility of damage to cables.

Small Resistors

On many 2400-volt systems it will be found that the resistor will be small enough to allow grounding transformers of five kva rating or less to be used. The resistor in Fig. 3 is rated 8 ohms and 26 amperes. The transformers shown are five kva each. The resistor kilowatt rating and transformer ratings will vary approximately as the square of the system voltage, and approximately linearly with system load.

High-resistance grounding equipment has eliminated the insulation failures that had plagued the 2300-volt driving motors turning this rubber mill.

Some means of isolating the transformer may be provided. If fuses are used in the transformer primary circuit, they should be applied for fault protection only. This is to make sure the grounding equipment will be in service to limit any overvoltages unless a fault condition actually exists in the transformer.

This is not intended as a recommendation of a low-resistance grounding method for all applications. It should be pointed out, though, that in many cases it is necessary to take immediate action in an effort to stop a series of insulation failures. The grounding method just described makes use of relatively inexpensive items. Since the resistor is a low-voltage and relatively small device, it can be made up of standard resistors of the type used in industrial control equipment.

Effectiveness

The effectiveness of this low-resistance grounding method, together with its low cost and the availability of equipment required, has prompted some engineers to install such equipment in all of their plants. In so doing, they have eliminated a problem that has arisen numerous times in the last 30 years.

There are, of course, many other methods that accomplish the desired result. The important point is that, regardless of system requirements, there is some grounding method available that will limit system overvoltages to a safe value without sacrificing plant productive capacity. Coupled with adequate surge protection on incoming lines, grounding can banish the losses from insulation failure due to overvoltage.

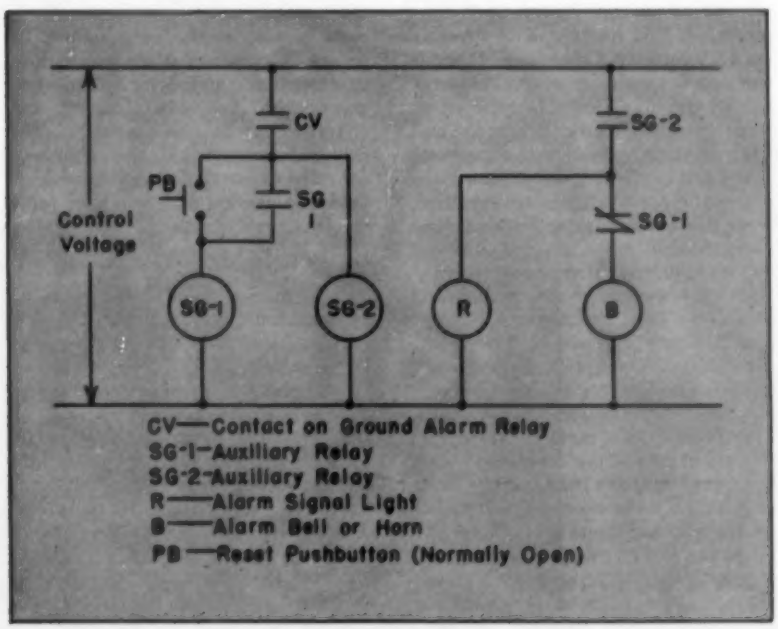
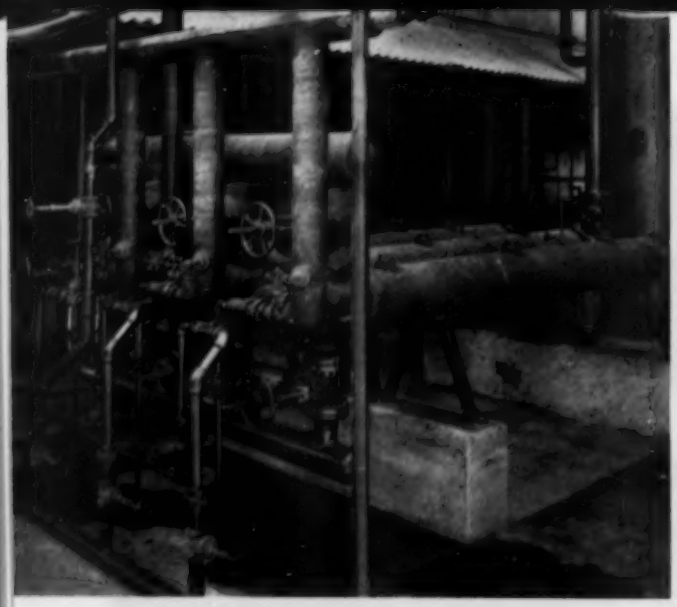


Fig. 5 — Contacts CV close when a phase's voltage is driven to ground voltage by a fault. Control voltage then powers the alarm bell and light.



Three tandem 8-in. exchangers, each with 86 sq ft of transfer surface, are installed in the Jacksonville, Florida plant of the St. Regis Kraft Corp. Units provide an estimated annual saving of $909 based on 10 hr/day, 300 day/year operation.

Bring Back Those Blowdown Btu's

J. A. FISCHER, Manager
Power Plant Division
Henszey Company

I&P EXCLUSIVE

THE NECESSITY of boiler water blowdown to control total solids concentration is recognized by all engineers in the steam generating field. Regular blowdown schedules permit the maintenance of a constant impurity concentration within allowable limits to prevent priming, foaming, mud deposits, and scale formation within the boiler. The methods of accomplishing regulation range from intermittent hand control by operating personnel, through the various types of continuous blowdown effected by automatic valves to automatic flow control in proportion to the makeup requirements.

Heat Recovery

Since the blowdown water is withdrawn at boiler temperature, it contains a significant amount of heat. Thus, any blowdown system should include some means of heat recovery to insure the most efficient and effective plant operation. The direct and logical method for this thermal conservation is to transfer the heat of the blowdown water to the makeup or feedwater by using a shell and tube heat exchanger. Some installations also include a flash tank to utilize flash steam at low pressures for process or heating, plus a heat exchanger to recover the heat of the unflashed water.

Heat exchangers, to provide trouble-free and efficient service in blowdown systems, must of necessity be of special design and construction. The quality of boiler water varies over a wide range, depending upon raw water source, feedwater treatment, allowable concentration level, operating pressure, and heat content. These considerations often are neglected when blowdown system heat exchangers are specified, with the result that rapid wear and parts failure make maintenance or early replacement imperative.

In operation the most vulnerable parts of a heat exchanger are those exposed to corrosion or flow wear, especially the tubes if they are not of a material resistant to the particular project conditions. The entire tube bundle also may be subject to vibration caused by harmony with adjacent rotating machinery and pulsating frequencies of the entrained liquids, and bent sections of the tubes are susceptible to impingement corrosion. However, with correct design, coupled with proper selection of materials and capacity requirements, a blowdown heat exchanger can be built as reliable and as trouble-free as one for any other purpose.

While several types of exchangers — coil, single pass, and so forth — and various shell enclosures have been used in the past, the two pass shell and straight tube exchanger is used almost exclusively today. Its principal advantages are economical construction, simplicity of design, accessibility for easy cleaning, and effectiveness of heat transfer. The design is amenable to the numerous considerations that must be evaluated in selecting an exchanger for a specific application.

Design Factors

¶ Total rate of heat transfer to be accomplished in Btu per hr.
¶ Quantity of fluids whose heat is to be interchanged in lb per hr.
¶ Temperature of fluids entering and leaving the exchanger in deg F.
¶ Operating pressures in psig.
¶ Maximum allowable pressure drop of the respective liquids in psi.
¶ Available data regarding the probable corrosive action to be expected.
¶ Specific heat, viscosity, and other fluid characteristics in the degree that they may affect heat exchange.

Since both fluids are liquids in the exchange of heat from blowdown to boiler makeup or feed, the selection

of blowdown water passage (through or outside of the tubes) is optional. It has, however, been found that if the blowdown is passed through the tubes under boiler pressure and at a high velocity (up to 10 fps), a minimum of residual solids will be deposited within the exchanger. In fact, the tubes will be continually scoured so that maximum heat transfer between the liquids is constantly maintained because of this cleansing action. The medium increase in temperature of the makeup or feedwater on the shell side precludes deposition of scale or solids in the shell, although operating instructions usually advise inspection and cleaning of the exchanger once a year. Also, since the hot, concentrated boiler water is the most corrosive element of the two liquids in the heat exchanger, its passage through the tubes — usually of copper, copper alloy, or steel alloy composition — presents the least problem in corrosion control.

Types of Exchangers

Most blowdown exchangers are of the one or two pass shell and two or multipass tube type. Tube bundles may contain one or several tubes per pass, depending on the flow requirements of the liquid, of either the return bend or floating head type. The return bend type has the advantage of cheaper construction, but it is harder to clean and replacing individual tubes is more diffiicult. The floating head type can be easily disassembled for cleaning and tube replacement but has the disadvantages of higher initial cost and the necessity of having an internal gasket on the floating head cover.

In multipass return bend type tube bundle construction, heavy cast return bends often are used to direct the passage of the fluid. Of necessity, their design is of comparatively short radii depending upon number of pass requirements, but their heavier section provides greater protection against fluid erosion. Selection of any particular type of construction, however, should be dependent on the engineering requirements of the installation and the recommendations of the manufacturer.

With designs of the free floating tube bundle type, no particular provision for differential expansion need be made except for sufficient shell length. These units include bronze or steel baffles, alternately spaced on the tube bundle, both to allow for tube support and to pass the shell-side liquid over as much of the tube surface as possible. Creation of as much turbulence as possible inside the shell by baffling (within the limits of maximum pressure drop) is desirable to effect the maximum thermal transfer. In a two pass shell type heat exchanger an additional baffle, running the length of the shell, is set between halves of the tube bundle assembly.

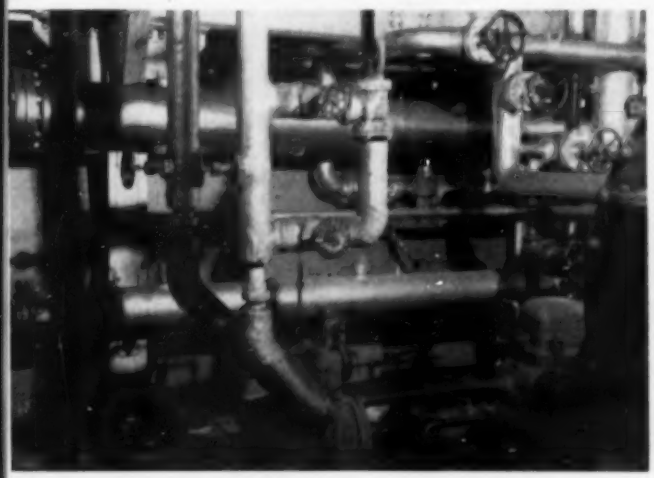
Materials

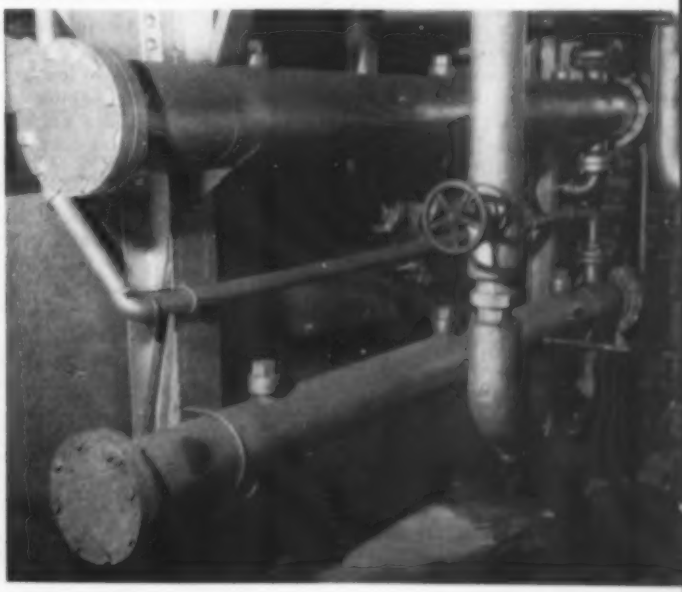
Materials in blowdown heat exchangers are influenced by water conditions, feedwater treatment, operating temperatures and pressures, and expected service life. Whether the heat exchanger is destined for Code service or not, most specifications are in accordance with API-ASME standards or the ASME Code For Unfired Pressure Vessels. In the low and medium boiler pressure ranges to 250 psig, copper, Admiralty metal, cupro-nickel, or Monel tubes are satisfactory. For higher pressures, carbon steel, chromium-nickel, and chromium-moly tubes are specified. Tube sheets are usually steel or copper alloys; pipes, shells, flanges, covers, and heads are invariably carbon or carbon alloy steels. Where necessary, all steel parts in contact with liquids may be chrome or nickel plated to insure additional resistance to corrosion.

Economics

The economics of blowdown heat recovery systems are of interest. While results vary widely and depend chiefly on the quantity of blowdown water involved, the amount of exhaust steam available for feedwater heating, cost of furnace fuels, and requirements of water treatment system, it has been found that appreciable savings can be obtained even with the lower horsepower package type boilers in the 50 to 500 hp classes. A well designed and correctly applied heat recovery system with a continuous blowdown control should amortize itself in from one to three years. With an expected life of from five to twenty years for the average blowdown heat exchanger, the savings involved are such that no responsible steam plant operator can afford to overlook the possibilities.

Carnation Company plants have used blowdown heat recovery for the past 30 years. These photos show two exchangers in the Oconomowoc, Wisconsin plant, designed to handle a boiler capacity of 20,000 lb per hr at 3-percent blowdown.





Reducing Boiler Plant Operating Costs

MICHAEL POPE, Consulting Engineer

I&P EXCLUSIVE

THE TYPICAL plant owner or manager has a tendency to direct his energies toward the production end of his business, where a capital expenditure appears to give a higher return than it would earn if invested in boiler-room equipment. He sometimes forgets that a savings of 10 percent in basic operating costs will produce a like increase in dividends, whereas each dollar of new business seldom results in a profit of much more than ten cents. It is the engineer's job to counteract this tendency on the part of the production man and to reduce basic operating costs to a minimum.

A careful survey often uncovers unnecessary wastes of steam and power that can be stopped with little capital outlay. These savings may not be as impressive as the results of a complete plant modernization, but they pay off amazingly well.

Recently I was attracted by the absence of any stack emission during the course of a tour through a textile mill. This was in an eight-boiler plant (oil-fired) which was not equipped with combustion controls. Further inspection revealed that the air registers were jammed wide open and were actually inoperable since the handles had been painted over two years before. A clean stack, certainly — but the large excess air supply had swept $10,000 worth of fuel each year up and out the chimney — a common source of waste.

There are many plants in which the cost of space heating and process steam, plus the cost of purchased or generated power, can be reduced as much as 30 percent by applying sound but simple engineering procedures, and often a careful check of boiler room waste can indicate ways to increase boiler efficiency. The following check list will help to reduce your boiler plant operating costs without much capital outlay.

CHECK LIST

☐ POOR CHOICE OF FUEL

Has the fuel market been surveyed carefully, comparing quality against price? If the plant is equipped to burn two fuels, make sure the choice is right, considering labor costs, handling costs, reliability of supply, storage facilities, and other pertinent factors. For a preliminary method of evaluation, high grade bituminous coal at $10.00 a ton can be considered equivalent to No. 6 fuel oil costing 5¢ per gallon, when burned at the same boiler efficiency. Therefore, if the fuel market in your locality furnishes oil at 5.5¢ and high grade bituminous coal at $10.00, the oil equivalent is $11.00 and coal is 1/11 or 9.1 percent cheaper than oil.

☐ EXCESSIVE COMBUSTION AIR

Is excess air causing waste in the boiler operations? Is there slight haze emanating from the stack indicating proper air supply? Have the draft and damper controls been carefully checked recently? Steam flow-air flow meters or other combustion guides are extremely useful in assuring proper combustion conditions. Occasional flue gas analyses would help to keep check of efficiency of combustion.

☐ POOR FURNACE DESIGN

Are the furnaces large enough to insure complete combustion before gases enter convection heating surfaces? The furnace volume should be checked carefully if consideration is being given to fuel conversion.

☐ POOR SETTINGS AND BAFFLES

Are the settings tight or do they permit excess air to enter the furnace? Do low grade refractories increase maintenance costs? Do cracked baffles permit hot gases to bypass the tube heating surfaces?

☐ IMPROPER FIRING TECHNIQUES

Are the stoker fires evenly distributed and without fire bed holes? Are the oil burners equipped with their correct burner tips for the oil being burned and are they properly maintained? Are fuel oil temperature and pressure adjusted to give thorough atomization?

☐ EXTERNAL TUBE DEPOSITS

Is firing as constant as possible? Is regular soot-blowing and handlacing carried out to ensure the tubes are clean? Clean tubes help to sustain optimum heat transfer and suffer less corrosion.

☐ LOW FEEDWATER TEMPERATURE

Have the condensate returns and auxiliary exhausts been checked recently? Hot feedwater reduces the work the boiler must do.

☐ EXCESSIVE BOILER BLOWDOWN

Is sludge being eliminated without wasting heat? A continuous blowdown with a heat recovery system may be a money saver.

☐ IMPROPER BOILER LOADING

Are too many boilers operated below their best rating for economy? On the other hand, do not overload any boiler for too long a period.

☐ INTERNAL TUBE DEPOSITS

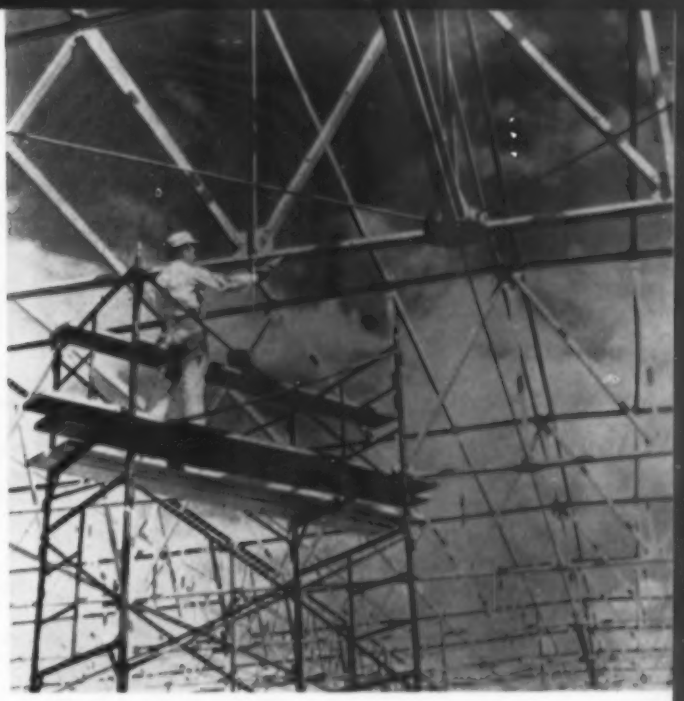
Does the feedwater treatment keep tubes and drums scale-free? Is the treatment preventing pitting of the boiler surfaces and removing dissolved CO_2 and oxygen from the condensate returns.

☐ IMPROPER STEAM DISTRIBUTION

Have pipe runs been shortened where possible? Are all hot surfaces adequately insulated? Are all traps kept in good operating condition? Are all heated spaces equipped with temperature controls?

Specifying Paint Protection

I&P EXCLUSIVE



Workmen apply finishing paint touches to the steel structure of a massive wharf shed in New Orleans.

The penalty, says the author, for poor surface preparation, inferior paints, or improper methods of application, is early failure of the protective coating system and increased maintenance and repair costs.

WARREN D. PALMER
Protective Coating Engineering and Inspection Service
Houston, Texas

PAINTING specifications should be directed toward eliminating the factors mainly responsible for the early breakdown and failure of a paint job. These factors — listed in order of their importance — include the following:

¶ Surface preparation, methods, and control are improper and insufficiently carried out;

¶ Control of application, methods, workmanship, and materials is inadequate;

¶ Type of coating best suited to the exposure is not selected;

¶ Film thickness of the coating is not adequate to furnish protection against exposure;

¶ Mechanical damage by construction workmen;

¶ Contamination between paint coat applications;

¶ Lack of cooperation by operating and maintenance men in helping protect painted surfaces from mechanical damage and operational spills or accidents;

¶ Maintenance repairs to a damaged area are delayed and improper;

¶ Inferior paints and materials are used indiscriminately.

Surface preparation is by far the most important — and may be the most costly — step in any painting program. However, no coating will give its best performance unless it is applied on a clean surface. A clean surface is one that is completely free of all mill scale, mill scale binder, rust, dirt, oil, or other foreign material that will disrupt the bond between the coating and the metal.

Sandblasting

Sandblasting is usually the most economical and practical method of cleaning a metal surface. On new construction, serious consideration should be given to the establishment of a cleaning and priming area near the job site through which all steel structures, piping, and equipment can be routed for surface preparation and application of the first prime coat. A central location will permit a qualified inspector to inspect and supervise all work, workmanship, and materials, as well as to set up good records on the paint history and the painting costs in terms of manhours and materials involved.

Pickling Process

Where large quantities of steel are to be used, a study should be made regarding the economics of setting up facilities for the removal of mill scale and cleaning by a pickling process at the job site. If this is not economically justified, it may be possible to have all new steel shipments routed through a galvanizing firm for pickling at their plant before arrival at the painting yard near the job site. Steel routed in this manner can be expected to rust slightly before arrival at its final destination but this fine rust is easily and rapidly removed by sandblast-

Mill scale and open voids of bare metal (arrows) will probably help cause early failure of the paint system.

The top right corner of the angle is badly corroded partly because of entrapped water and a rough weld.

ing. This arrangement can be expected to reduce surface preparation costs as much as 10 to 15 cents per square foot of surface.

Some thought should be given to the sand specified for the blasting job, keeping in mind the purity (fresh water washed, minimum clay and unsuited sands), nature of the anchor pattern desired, speed of cutting, labor and material costs, and the minimizing of the dust fog from the blasting operation. A fine to medium (15 to 35 screen) hard silica sand of a composition that will produce an even anchor pattern of one to two mils between the peak and the valley is preferred. The finer the sand, the more cuts produced per given time. Also, the lower the air pressure or the finer the sand, the shallower is the anchor pattern.

An unscreened sand, such as most river sand, contains a large portion of fines which are too soft to cause much cutting action. These sands will produce an unnecessary dust fog and little cutting action, resulting in an increased cost of the surface preparation and a very dirty and undesirable condition. Clay and other soft silt or minerals will become imbedded in the anchor pattern and will not make an acceptable surface for painting. The humidity of the air or moisture in the sand can cause the deposit of a moisture film over the prepared surfaces. It is important that the surface be dry as well as clean before paint is applied. The inspector's magnifying glass, litmus paper, and moisture tests will quickly indicate whether or not the surface is ready for painting.

Special care is necessary to prevent sand settling on and ruining freshly primed or painted surfaces. Enough room should be provided in the yard and blasting and painting operations separately scheduled. Where handling of the blasted material is no problem, it may be advisable to sandblast and apply a vinyl butryl wash primer in the blasting yard, then transfer the material to another area for priming.

Wash Primers

Where humidity and moisture conditions are high, the vinyl butryl wash primers are very useful. These wash primers can be brushed or sprayed, but a wet coat is essential. A brush application is recommended after sweeping or blowing all sand from the freshly blasted surface. The brush insures a wet coat and a washing action to free fine dust from the metal surface. The coating dries rapidly — in about twenty minutes to one hour. These formulations usually contain sufficient phosphoric acid to etch the steel and to react with small particles of rust which may still remain in the pits. The alcohol will tend to dry the surface as it evaporates. The thin vinyl coating that remains will offer good protection to the metal surface for a short time. However, the application of the first prime coat is recommended as soon as possible — preferably about two hours after drying of the wash primer.

Although it is not recommended, surfaces of tanks have been protected by wash primer applications for as long as thirty days through a damp and rainy period with a minimum of reblasting required before the first prime coat was applied. The application of this wash prime coat is not considered as an application of paint but as a part of the blasting and surface preparation. Its use is justified by the removal of fine dust, moisture, slight rust in pits, and the reduction of repeat blasting required during bad or damp weather. Wash prime applications will also tend to increase adhesion and reduce creep of the coating. Wash primers are not recommended for surfaces that will be exposed to temperatures above 300 F.

It is essential to make certain that all blasted surfaces are dry and free of oil, grease, dirt, and other foreign matter before the application of either the wash primer or the first prime coat.

For general painting of metal industrial surfaces, specifications commonly call for synthetic alkyd type enamels. If the metal surface has been thoroughly cleaned and wash primed, minimum wetting is required. Therefore, a red lead zinc chromate or red lead oxide type formulated primer, which will dry

for recoat in four to twelve hours, is a good choice. Special consideration is necessary if vinyl, neoprene, and other like coating materials are to be used instead.

Prime Coat

The prime coat should build to a one mil dry thickness or more and should be highly resistant to abrasion and mechanical damage. Brush application of the primer is preferred. In order to provide ample coverage to the anchor pattern peaks, a passivating prime coat should have a dry thickness of two to two and a half mils. This will usually mean the application of two coats. The application of this second coat can wait 30 days. Following removal of weld spatter or slag, and after spot priming, a 12 to 48 hour drying time is recommended for this second application of prime coat.

The intermediate prime coat is applied after spot touch up and the second red lead coat. Its primary purpose is to build protective coating film and provide flexibility. This coat may be either brushed or sprayed and should add a dry film thickness of one and a half mils. A drying time of 12 to 48 hours is recommended as a minimum.

Color Coat Finish

Two color coats are usually necessary to furnish complete hiding and film thickness. These formulations generally dry hard overnight and add a dry film thickness of about one mil per coat. Care should be taken to choose colors that are stable in the atmosphere and that are pleasing to the eye. Several plants have adopted safety color codes and other bright color combinations along with the black or dull shades. The result is pleasing, and functional.

Suppliers' Recommendations

Since various pieces of equipment and other plant parts are subjected to different exposure conditions, the general painting specification should be supplemented by paint suppliers' technical recommendations in what is generally called a paint and color schedule. This lists the item, functional number, description; then specifies the surface preparation, first prime coat material, number of coats, second prime material; and the number of finish coats, color, and material. A list is also furnished of approved vendors and code numbers of paints that will be acceptable for use on the particular job.

The dry film thickness should be specified within reasonable limits and should be shown for each coat application with a final build film of minimum thickness. Individual layers of alkyd enamel should be applied to result in a total thickness of six mils. This allows a safe margin for coating thickness variations. To do this with synthetic enamels without the use of hot spray or other special methods requires a four full coat application. Provision should be made to test the coating for holidays following the application of the third coat or before the application of the final two coats. This can be done with an electric holiday detector. Other material coatings, and unusually severe exposure conditions, may go as high as 10 to 20 mil total film thickness.

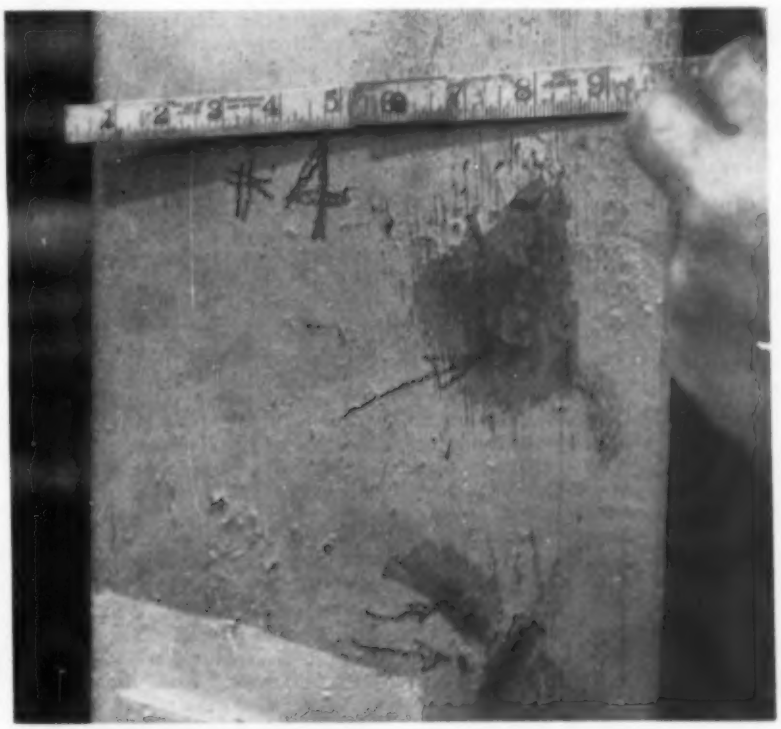
Evaluation

It may not be possible to know exactly which paints will give the best performance in special exposure areas, and there is usually only a limited time to allow for performance evaluation. However, the person or organization preparing the materials specifications should know the general atmospheric conditions prevailing in the plant locations, the process material being handled and present in the various areas and equipment, and he should have an understanding of the limitations of the various basic coating types. Screening of some of the possible recommended paint formulations can be done by preparing small panels and exposing them to spillage or immersion tests.

Manufacturers' sales engineers in most instances are qualified and willing to point out limitations of their various formulations. They are also anxious to follow through on application methods to satisfy themselves that their coatings are being properly applied to insure maximum performance. The advice is free and will be found very helpful even to those experienced in paints and coating problems. Coating manufacturers located in the same area as the plant will generally be more interested and experienced in the specific local problems than those whose facilities are more distant.

Performance Record

The preference is to use paint formulations that are in regular or volume production by the manufacturers. These materials have the manufacturers' code number and are made under strict formulations and quality control methods. It is performance that is desired after application. Therefore, if good field records are established and maintained — showing among other data, the



A typical example of premature paint failure due to poor and improper surface preparation and lack of sufficient film of the protective coating.

manufacturer and the code number — the performance record will be of value to the manufacturer of the paint as well as to plant personnel.

The paint manufacturers are concerned with the problem of producing better paints for less. The cost, quality, and combinations of the materials making up a paint usually account for the difference in price per gallon of paint delivered to the job. If the application requires the best grade of material, any saving resulting from the use of inferior paint will probably increase the cost of protection over a period of years.

Inferior Paints

The pitfalls encountered when inferior paint materials are used are obvious. The fact is that only penny savings are involved in the cost of the paint materials as compared to the dollar costs involved in labor of surface preparation and application. No reputable paint manufacturer will knowingly recommend one of his inferior grade materials for application on a first class job. By listing approved materials for use on the job, plus adequate supervision, inspection, and control, the use of inferior materials can be eliminated.

Paint, applied to a properly cleaned surface, that fails due to the nature of the exposure — such as concentrated chemicals or solvents — presents no serious cleaning problem when the surface must be prepared for repainting. Failure due to temperature conditions may cause a greater problem. A clean surface is always the best performance insurance for the paint system.

Scheduling

Scheduling completion of a paint application usually presents a problem. There never seems to be a time when work is at a state that would permit painting only. Yet, the paint must be properly applied, maintained free of mechanical or other damage until completely dry. On occasions, buildings and equipment are painted and then the paint wiped off by pipe fitters, iron workers, or operators while moving about their work. This is one example of wasted paint and manpower. If full protection, beauty, and performance is expected from the dollars spent, it is essential that sufficient time be allowed to permit the paint crews to do their work properly and free from damage to the finished coating film.

Painting Costs

Surface preparation and painting costs will vary and depend upon the painting specification, type of coating, working conditions, down time due to weather, job location, the amount of work, and other pertinent factors. Definite cost figures vary so widely that published data usually refrains from quoting them in terms of dollars and cents. Considerable information on this subject may be found in Volume 1, "Good Painting Practice", 1954 Edition, page 379. This reference is published by, "The Structural Steel Painting Council", 4400 Fifth Ave., Pittsburgh 13, Pa. However, for the sake of comparison only of the costs of various operations required when painting, the following figures, based on typical contract work where the contractor furnishes labor, equipment, scaffolding, air and sand, and insurance; and including overhead and profit, have been prepared. These contract labor costs run approximately as follows for work under the best conditions:

A #1 condition sandblasted surface preparation (including the wash primer application)	25¢/sq ft
Application of first red lead prime coat	6¢/sq ft
Grinding weld spatter, general cleaning, and spot priming after erection (based on total area)	4¢/sq ft
Application of second red lead prime coat	5¢/sq ft
Application of iron oxide prime coat	5¢/sq ft
Application of two color enamel finish coats	10¢/sq ft
Total labor	55¢/sq ft

The above prices are usually for brush applications. Spray applications of the intermediate and the two final finish coats may reduce the total application labor costs to a total of 50¢ per sq ft. These figures do not include special handling costs which may be encountered in the sandblasting and painting yard.

The cost of supervision, inspection, and control personnel for the entire job will run about 6¢ to 8¢ per sq ft. Paint and other material costs for the system outlined above may run from 15¢ to 20¢ per sq ft.

Cutting Costs

Adding all these costs together, the total cost for painting the new plant runs from 71¢ to 83¢ per sq ft. The normal reaction by management to these figures is that they are far too high and that the expenditures will have to be reduced. Therefore, sandblasting is eliminated. Rust and dirt are removed by hand. Mill scale and the remaining rust and dirt are sprayed over with red lead primer. This reduces the surface preparation costs to roughly 15¢ to 20¢ per sq ft. The cost of material and labor for the application of subsequent coats do not change. Usual practice is to apply a three coat system and allow for no supervision, inspection, and job control other than that which the construction engineer can spare.

Adding the eliminated costs:

Surface preparation:—	
Preferred method—labor, equipment, and sand	25¢/sq ft
Second cost-cutting method	15¢/sq ft
Reduction in cost	10¢/sq ft
Spot priming and cleaning of welds (labor)	4¢/sq ft
Usual practice makes no provision or allowance for such costs	None
Reduction in cost	4¢/sq ft
Application of second red lead prime coat:—	
Labor plus material	8.5¢/sq ft
Usual practice omits this cost	None
Reduction in cost	8.5¢/sq ft
Supervision, inspection, and control costs	8¢/sq ft
Usual practice makes no provision or allowance for such costs	None
Reduction in cost	8¢/sq ft

Thus, painting costs have been reduced 30.5¢/sq ft resulting in a total cost of 52.5¢/sq ft for this second method. However, this money has been spent for painting over an unsound surface. If the surface bond gives way, the total protective film will fail, and the entire expenditure is lost.

There have been many instances of paint failure due to no other reason than such poor practice. Failures of this sort have been noted generally on several new plant structures as early as six months after the application of the finishing coats of paint to the surface.

Frequently it is impossible or impractical to sandblast within the operation area once the plant structure or installation has been completed. Therefore, it is particularly important that surface preparation be correct on new work. If the painting and corrosion protection of the plant is not done right the first time, it becomes a never ending factor to be dealt with during the entire life of the plant. Such costs may well determine the success or failure of the plant's operation.

Five power houses having a total of 194 radial, gas-burning engines are installed at ALCOA's Point Comfort Plant. Ventilation is important since each engine radiates more than 700,000 Btu per hr and summer temperatures often exceed 95 F.

Ventilating a Diesel Power House

...Success Story From Point Comfort

I&P EXCLUSIVE

Ventilating air in power plants can be used to cool equipment as well as provide personnel comfort. Efficient ventilation was an important part of the design of five power houses at ALCOA's Point Comfort Plant.

H. D. KEEFER, Power Superintendent
Point Comfort Works, Aluminum Company of America

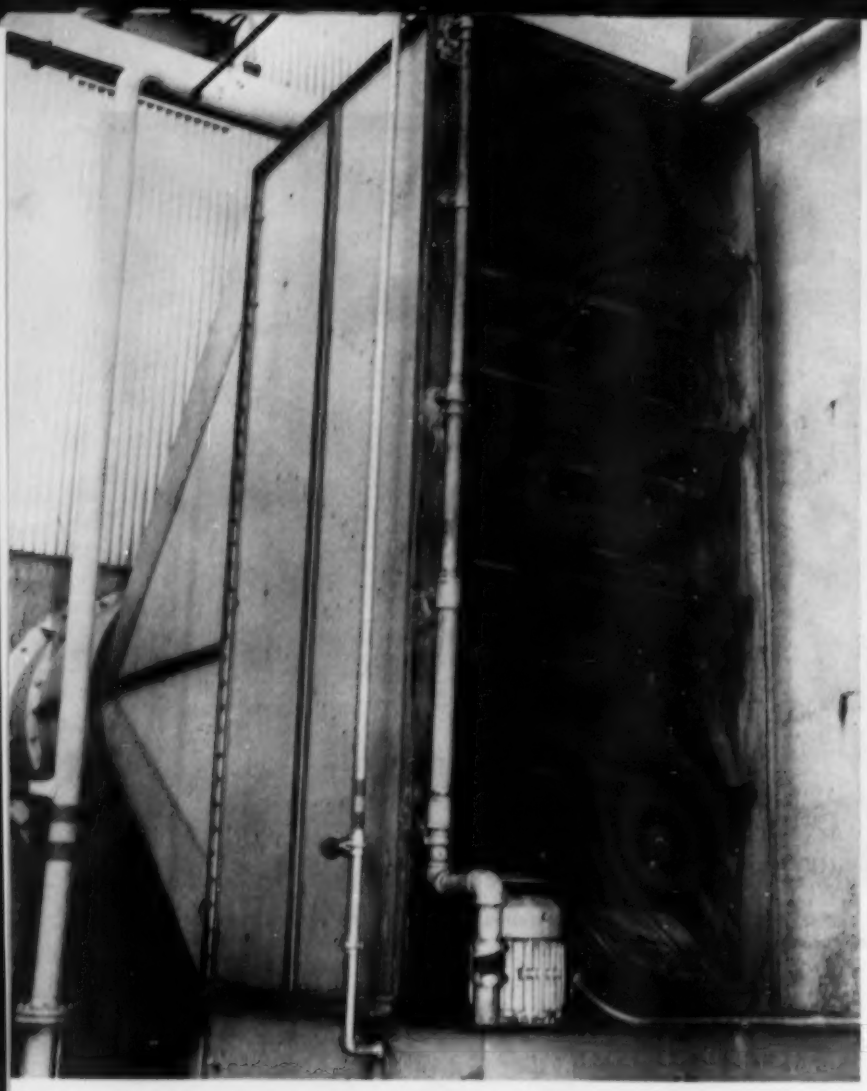
VENTILATION played an important role in the design of the power houses at ALCOA's Point Comfort Plant. In addition to being located in an unusually hot and humid climate — the Texas Gulf Coast — the power houses have an unusually high concentration of heat-radiating equipment.

Installed in five power houses are 194 d-c generators, each driven by a radial, natural gas-burning engine. Three of the buildings each contain 40 engines of 1650 hp, and the other two buildings each contain 37 engines of 1950 hp. The amount of heat radiated from each of the 1650 hp engines and its auxiliaries is approximately 700,000 Btu per hr, while the larger units radiate as much as 800,000 Btu per hr.

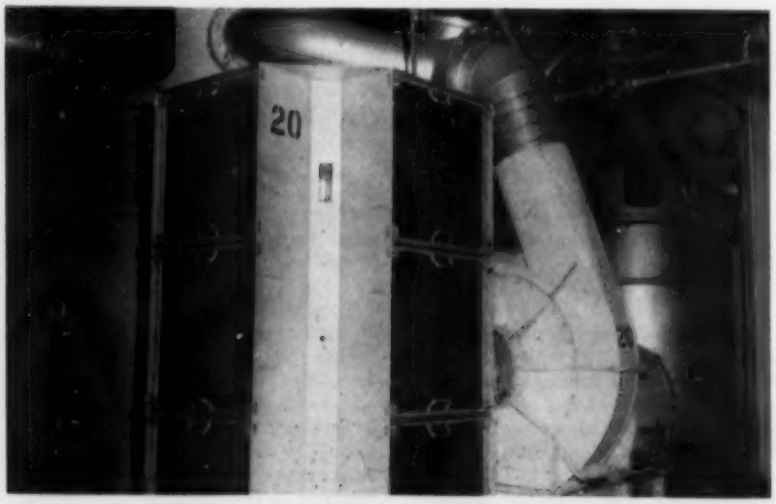
Each of the power houses is about 500-ft long and 52-ft wide. They are of standard steel frame construction with aluminum siding, the aluminum being particularly well suited for this type of application because its high reflectivity and low heat radiation helps hold down the temperature within the building.

Ventilating air taken into the power houses serves three basic functions — personnel comfort, equipment cooling, and combustion air for the engines. Ventilation is required practically the year around for personnel comfort, being particularly important during the six to eight hot months of the summer.

Cooling of the ventilating air for the equipment is essential because



One evaporative cooler washer is provided for each engine. By means of water sprays, these units cool the air and remove all dust and abrasive materials.



In addition to being cleaned by the evaporative washers, that portion of the air to be used for engine scavenging is further cleaned by dry-type filters.

of the high ambient temperatures. By designing an adequate system, it was possible to eliminate the investment which would otherwise have been required for special electrical equipment design features such as special insulation or auxiliary ventilating equipment.

Because of the high outside temperatures, cooling of the scavenging air for the engines also is required in order to obtain the best possible combustion efficiency.

Washers

It is necessary for all air entering the power houses to be free of dust and other foreign matter before it is used either for equipment cooling or combustion air. To meet these conditions, the outside air is drawn into the building through evaporative cooler washers. In these units, a water spray cleans the air and cools it by evaporation. A self-cleaning pad of aluminum mesh material in each washer helps to maintain a high cleaning efficiency and to reduce the amount of maintenance required. One evaporative washer is provided for each engine.

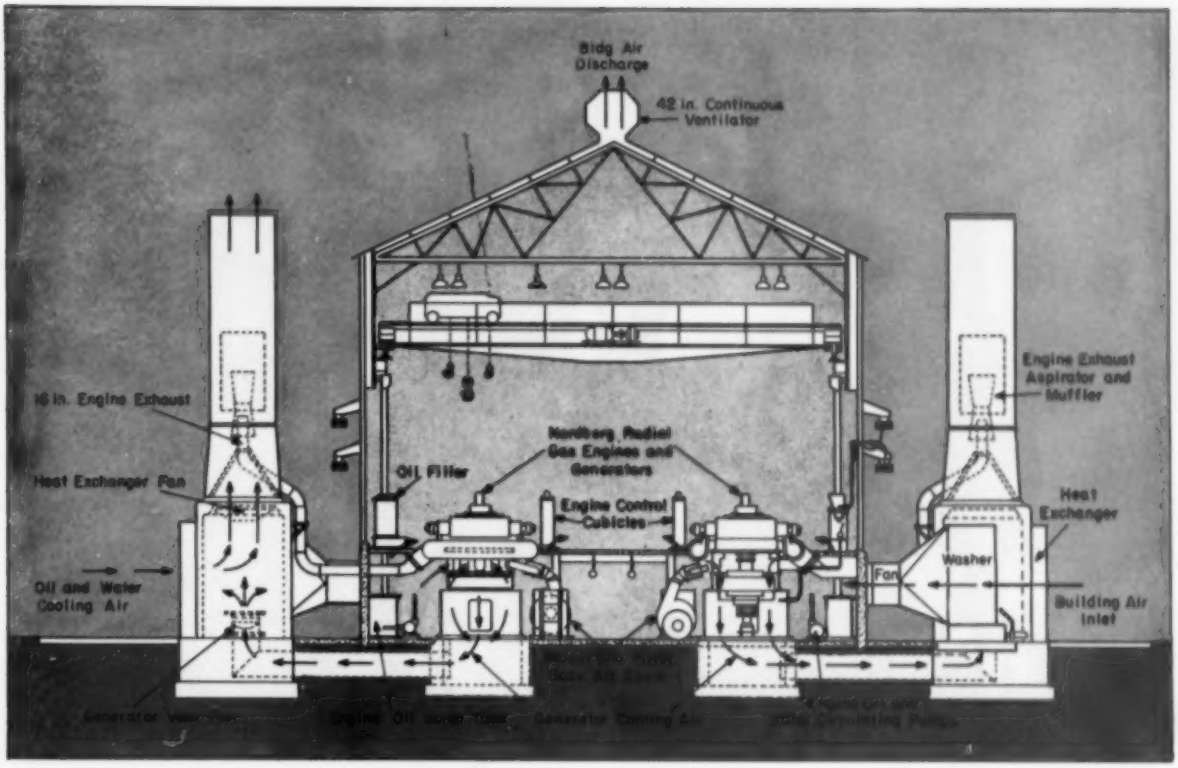
Fans immediately beyond the washers discharge the air, under a slight pressure, to the lower floor of each of the power houses. This area acts as a large plenum chamber for distribution of the air to the operating floor above.

Equipment Cooling

The total air introduced into each of the buildings is approximately 1,225,000 cfm, which provides a complete air change every two minutes. Approximately 30 percent of this air is drawn into the generators through annular spaces located between the engines and the generators. An aluminum exhaust stack, located outside the plant, is provided for each of the engine-generator units. A fan in the base of the stack draws the cooling air downward through the generator windings and discharges it to the stack through a connecting underground duct.

Another 20 percent of the cooled and filtered air is used as scavenging air for the engines. Dry-type filters further clean this air before it enters the combustion chambers in order to remove any remaining abrasives. Exhaust gases from the engines are discharged to the stacks through exhaust lines passing through the building walls.

Exhausting all heated air from the engines and generators to stacks outside the power houses is an important factor in maintaining comfortable working conditions inside the



Part of the air is drawn through the generator windings and is discharged to the exhaust stacks. A second portion flows through control cubicles to the second floor, thus providing equipment cooling and ventilation in the operating room.

buildings. In addition, the stacks have been built sufficiently high to assure that, under normal conditions, none of the hot air will re-enter the buildings.

An additional function of each exhaust stack is to remove the heated air from a radiator located at its base. These radiators are used to cool the lubricating oil and cooling water for the engines.

The remaining 50 percent of the ventilating air is used to cool equipment and to provide comfortable working conditions. Flowing through openings in the operating floor, it passes through the control cubicles and switchgear cabinets and is discharged into the operating room through louvers in the sides of the cabinets. The heated air then rises to the top of the building and is discharged through roof monitors.

With an outside temperature of 95 F and a relative humidity of 85 percent, a condition which is quite common in this area, the temperature in the lower floor of each power house was recorded as being 83 F during recent tests. The temperature in the operating floor above was 92 F and the air leaving the roof monitor was 110 F.

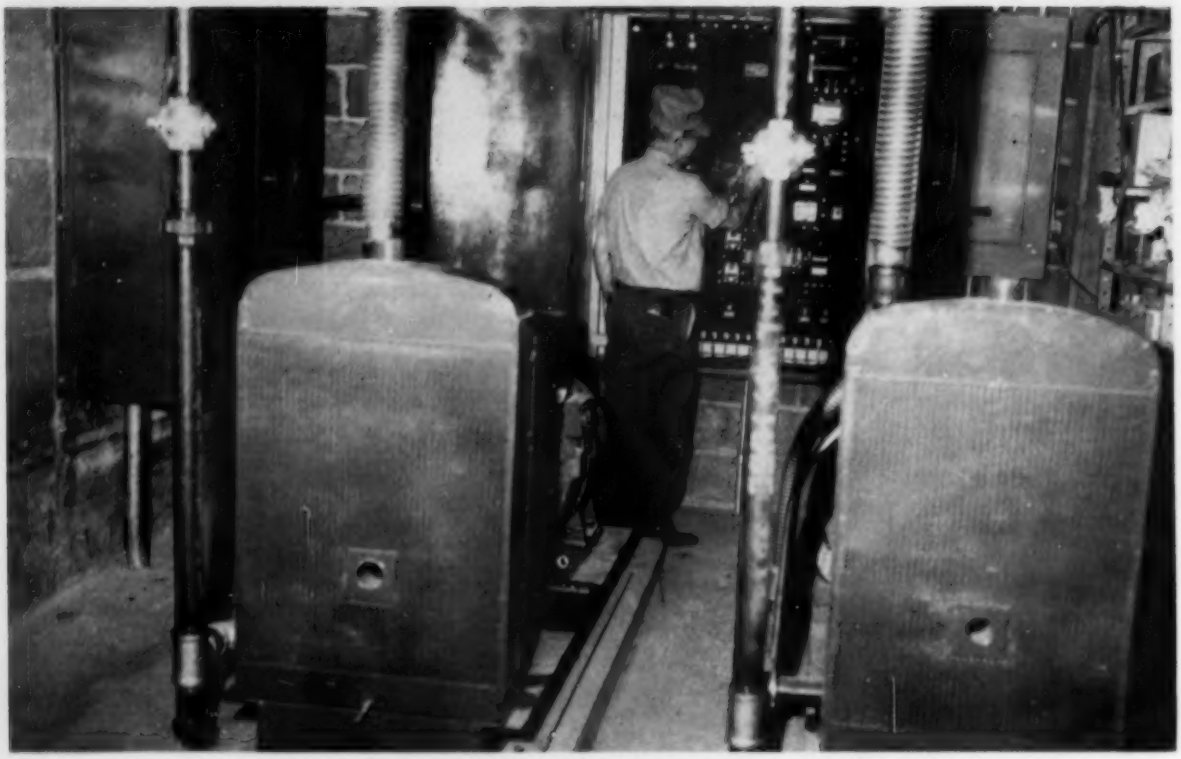
The results of the research and careful planning that went into the design of these power plants have been very gratifying. The cooling of the equipment and the comfort to the personnel are highly satisfactory, and no field changes have been found necessary in the five years that the plant has been in operation.

Packaged Hydroelectric Plants Installed by Utility

PACKAGED equipment, with its savings in installation costs, lower initial costs, and simplification of engineering planning is gaining wide acceptance by industrial users. In many lines of equipment the machine, its driver, and the auxiliary components can be purchased separately or as a single packaged unit. It is now even possible to buy a packaged hydroelectric plant.

California Oregon Power Company has installed five such units as part of its North Umpqua River Power Development in Oregon. Manufactured by Westinghouse Electric Corp., a typical unit consists of an outdoor, vertical-type, 15,000-kw generator, three 5888-kva single phase transformers, and associated outdoor metal-clad switchgear and switching structure. The generator, with direct-connected main and pilot exciters, is operated at 514 rpm and is connected to a 21,000-hp turbine. The power generated is transformed from 7200 v to the system voltage of 13,200 v.

Two additional packaged power plants soon will be installed to complete the power development. Ratings of the new units will be 30,527-kva and 34,737-kva.



These two emergency generators, with control panels for each building, are automatically test run weekly.

Modernizing a Distribution System

I&P EXCLUSIVE

WALTER RUDOLPH, with
A. S. KUHL, Consulting Electrical Engineer

ST. VINCENT'S Hospital in Erie, Pa., like many across the country, experienced growing pains for a number of years. Some of the older buildings were wired 50 years ago. Such wiring is quite aged and inadequate. Loads were swelled by more laboratory equipment, more kitchen needs, more operating room facilities, increased levels of illumination, air conditioning — and wider use of television throughout the hospital.

The management foresaw more expansion in the near future. Consulting electrical engineers were called in to study the hospital's electrical needs and to design a distribution system adequate for the foreseeable operations.

The engineers were told to design as reliable a system as could be made, a system that would require only minimum changes when future buildings were erected, and a system to which new loads easily could be added. (For instance, it is expected that there soon will be a 14-story addition. With the new system, it is planned to cut into the existing loop to add another unit substation for the addition. There is a spare primary circuit breaker cubicle ready. Vault space is also provided for future addition of primary circuit breakers.)

Since reliability was to be, and is, the key to the new distribution system, the secondary network system was deemed most suitable. The primary power comes in at 4160 volts, over two individual feeders, mounted on separate poles, from two different utility substations.

The utility supplies a short-circuit capacity of 32,000 kva, which means that the secondary feeder circuit breakers in the unit substations can be 25,000-ampere, drawout breakers. The anticipated hospital demand for the present building program is approximately 600 kva, so three unit substations of 300 kva each were installed. In this way, the normal hospital loads can be served from any two unit substations, should an outage occur on any one of them.

A backbone was put over the existing electrical distribution system by installing new feeder distribution panels, each being fed from one of the three new substations. (The substations were placed in a hospital court in underground concrete vaults.

The three hospital substations, then, each serve three main divisions or groupings of hospital buildings. On each main feeder to a given building is installed an automatic transfer switch. Upon failure of the secondary feeder to that building (or any building in the group,) an automatically started, natural-gas-driven standby generator picks up the load.

Emergency power is supplied from

These constantly trickle-charged 120-volt storage batteries will trip main primary feeder switchgear.

Main line circuit breaker on one of the hospital's 300 kva unit substations in the underground vault.

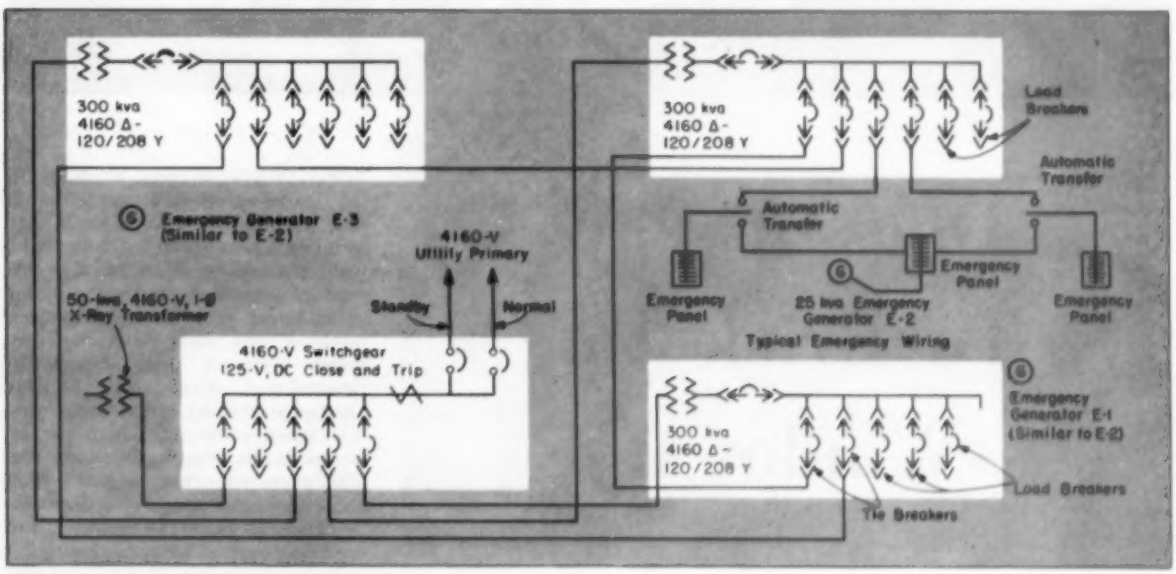
these units to illuminate operating rooms, hallways, stairways, elevators, the boiler room, and the area where the standby units are installed. Power is also supplied to the blood bank and similar critical refrigeration facilities, and to operate the nurses' call system.

Gas power was chosen for the emergency units for economy, and because of state regulations. Using natural gas, the hospital was permitted to set the standby units wherever feasible in the hospital basement. There is no stored-fuel hazard, and no special tanks buried outside the buildings.

Each of the standby generator units is rated 25 kw, 120/240-volts, single-phase, 60 cps, and is coupled to a six-cylinder engine for motive power. The control panel for each unit is equipped so that once a week, whether or not emergency use has been required, the gas engine will automatically be started and will test run for half an hour before shutting down. An alarm bell rings if the emergency units fail to start and operate when the automatic test system is energized.

Spare conduit has been installed for primary incoming lines, the primary and secondary feeders between the three substations, and for the feeders to each building. Spare conduit for telephone, fire alarm, and communication circuits is also provided. The main primary vault also contains a series of glass-jar, lead-plate storage batteries that provide 120-volt, d-c closing and tripping power for the main primary switchgear, for operation of the primary transfer circuit breaker from normal to standby utility feeder, and for tripping the main primary feeder circuits. The batteries are constantly charged by an adjustable trickle-charging unit.

Justifying the investment in reliability of two separate utility feeder lines was a recent 25-minute failure in one of the utility substations. This incident made the investment in service continuity for the new distribution system worth-while.



For maximum service continuity, primary substation feeders are backed up by tie breakers forming a secondary loop.

Heat losses through the large windows of this textile mill placed an unusually high load on the air conditioning system. To eliminate these losses, management decided to . . .

. . . brick up the windows. Concerned over the possibility of claustrophobia among employees, they left small areas of glass brick. Workers later boarded them up to stop glare.

Does It Pay To Brick Up Windows?

ROY A. PALMER, Duke Power Company

SINCE WINDOW GLASS first became practical for use in industrial buildings, windows have been as much a part of the building as the walls themselves. They are a disadvantage whenever ventilating or air conditioning systems are employed, however, and many new plants are being designed with windowless construction. A number of older plants are bricking up their windows.

It takes courage to break away from long-standing tradition, but the advantages of eliminating windows are often very much worth-while. Bricking up windows reduces the operating costs of air conditioning by reducing heat gain during summer cooling and heat loss during winter

heating. In addition, temperatures can be maintained more uniformly throughout the plant.

With mechanical ventilation, the filtered air entering the room carries much less dust, dirt, and soot than air entering through windows. The clean air is particularly important where dust causes damage to the products being manufactured. The cleaner air also lessens maintenance costs by reducing the frequency of painting and cleaning and by cutting wear on equipment.

Windows exist for two purposes—to provide light and ventilation. Since ventilation can be better controlled in other ways, we can eliminate the windows with respect to this requirement. An analysis of how effectively windows provide light will show that their usefulness for this purpose also is not as great as we often think it is.

Light Meter Readings

Using a light meter, it can be shown that on bright, sunny days, the intensity of the light near the window is relatively high. However, it drops off very rapidly as the distance from the window is increased. Workers performing tasks some distance away from the windows are seriously handicapped in seeing easily, quickly, and safely. Early morning and late afternoon shifts derive little benefit from the light coming through the windows. They are of even less value on dark, cloudy days.

Some have argued that daylight from windows cuts the cost of artificial lighting. One has only to check his own plant to find that, in almost every instance, the lighting system is in full operation even when the sun is shining at its brightest. Artificial lighting is necessary because of the low intensity of daylight away from the windows.

Windows often become a source of glare — brightness which hinders rather than helps vision. Shades, venetian blinds, or awnings can be used to control the brightness, but they are seldom properly adjusted to coincide with changes in the intensity of the light as the sun's position changes. Also, they represent a large investment and need considerable maintenance. To avoid these expenses, many plants have painted their windows with translucent paint. This reduces the transmission of light as much as 90 percent, thus defeating the original purpose of the windows. Is it any wonder, then, that many plants have bricked up the windows in their buildings?

From this analysis, we can readily appreciate that daylight from windows costs money. Each square foot of glass costs more to install than the cost of a square foot of brick. Cleaning of windows plus occasional repairs, as well as shades or awnings, are definite costs. The heat losses due to windows may be a sizable factor in some plants, and in the summer the radiant heat from the windows may add to the discomfort and lowered efficiency of the workers.

Eliminating Windows

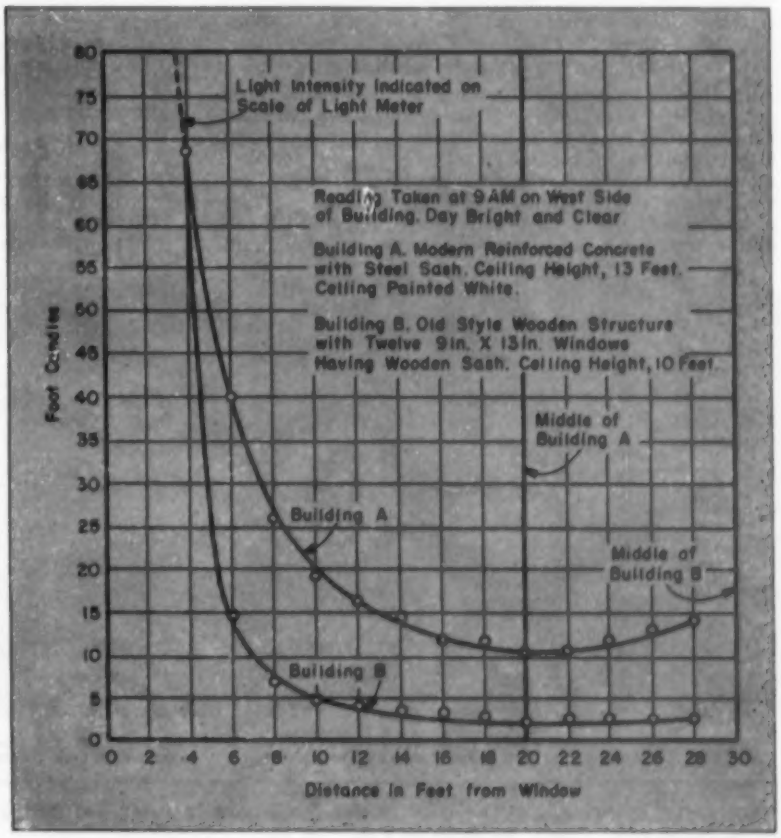
By eliminating windows, the complete interior floor area can be used. The greater uniformity of artificial light and ventilation permits the placement of machines and work centers according to production needs. The unrestricted wall surfaces also permit greater flexibility in locating equipment.

Flexibility in arranging machines, inspection tables, and other items in a windowless plant contributes greatly to speeding production and reducing costs. The production workers also do better work when provided with the clean air, at proper temperature and humidity, and with the improved lighting made possible by eliminating the windows.

One of the main objections raised by some is the fear of claustrophobia in bricked-up buildings. However, that fear is never considered by any of us when we go to a theater. Although we seldom realize it, almost all large retail stores also are windowless.

The windows in a considerable number of industrial buildings either have been bricked up or were eliminated from the design. The successful operation of these plants is evidence that the fear of claustrophobia has not been a problem.

Since engineers have shown daylight costs money, few saw-toothed industrial buildings have been constructed. Mechanical ventilation or air conditioning and low-cost, uniformly distributed illumination have made such buildings impractical, both from the cost and functional viewpoint. Windowless buildings, properly ventilated and lighted, provide cleanliness, comfort, and good lighting for one shift or three, as the needs of the factory may dictate.


Light Intensity Indicated on Scale of Light Meter
Reading Taken at 9 AM on West Side of Building. Day Bright and Clear
Building A. Modern Reinforced Concrete with Steel Sash. Ceiling Height, 13 Feet. Ceiling Painted White.
Building B. Old Style Wooden Structure with Twelve 9 In. X 13 In. Windows Having Wooden Sash. Ceiling Height, 10 Feet.
Middle of Building A
Building A
Middle of Building B
Building B
Foot Candles
Distance in Feet from Window
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80

Although the intensity of light near the windows is high, a light meter shows that it drops off rapidly as the distance from the windows is increased.

Modernize Distribution Systems

with SORGEL Air-Cooled Transformers

Increase feeder capacity by transmitting electric power to load centers at higher voltages

The Most Practical Type Transformers to Reduce Voltage at Load Centers

Air-cooled dry-type transformers are the most practical type for indoor installations, and it is important that the transformers are of the best quality — SORGEL transformers. They require little or no maintenance; no liquid to check or replenish; no fire hazard; small and compact; economical; easy and convenient to install; no vault required.

Increased Efficiency

Sorgel air-cooled dry-type transformers are so quiet in operation that there is no disturbing hum; therefore, they can be installed in almost any convenient place inside of buildings, close to the load center. This results in shorter feeders, better voltage regulation, more efficient distribution, and lower wiring cost.

Easy and Low Cost Installation

All self-contained in a single unit — either single phase or 3-phase — with simple connections to make. No separate mounting brackets or junction boxes to make or buy. Substantial wall brackets, with slots for bolts, or floor mounting base, are an integral part of Sorgel transformers. Roomy connection compartment with wide choice of knock-outs. All transformers are equipped with solderless terminal lugs and permanent connection diagram.

Liberal Design for Full Rated Load

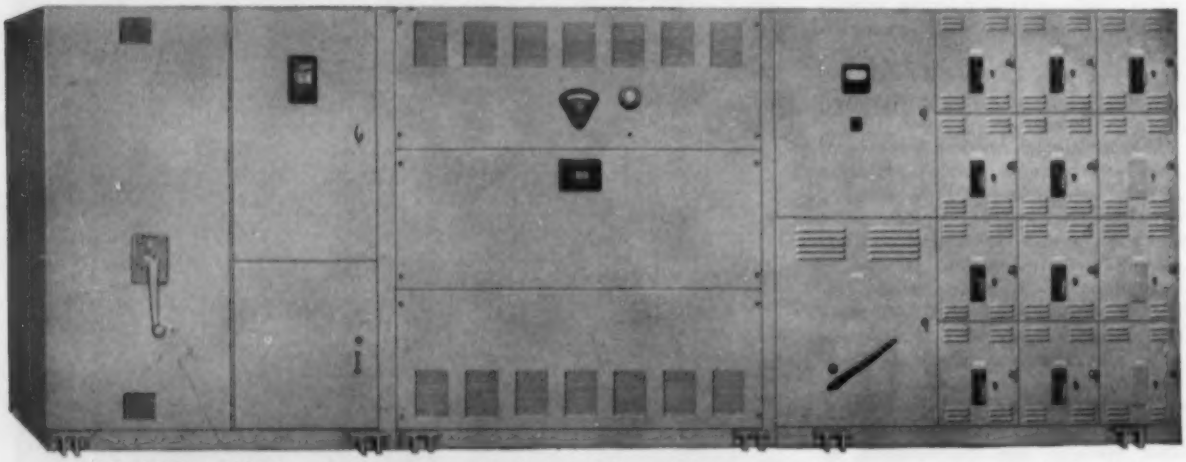
Sorgel transformers are guaranteed to carry the full rated load continuously. They are so liberally designed that they can safely carry on overload during an emergency.

Large Variety for Every Purpose

These transformers are available in a large variety of sizes and types for every purpose. ¼ Kva to 1000 Kva single phase. 1 Kva to 3000 Kva 3-phase. All standard voltages, such as 120, 208, 240, 480, 600, 2400, 4160, 4800, 7200, 13,200, and up to 15,000 volts, and any intermediate or special lower voltages.

A Perfect Partner for Substations

Sorgel transformers can also be incorporated in substations, complete with primary and secondary switchgear. They are procurable with any make of switchgear, and from any substation manufacturer.



Unit substation, with primary switchgear—metering—2000 kva 3-phase, 13,200 volt transformer—secondary circuit protection. Shipped completely assembled, wired and tested, ready to connect to lines. Nothing else to buy, make, or assemble.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 841 West National Ave., Milwaukee 4, Wis.

40 years experience in the development, manufacturing and application of transformers.

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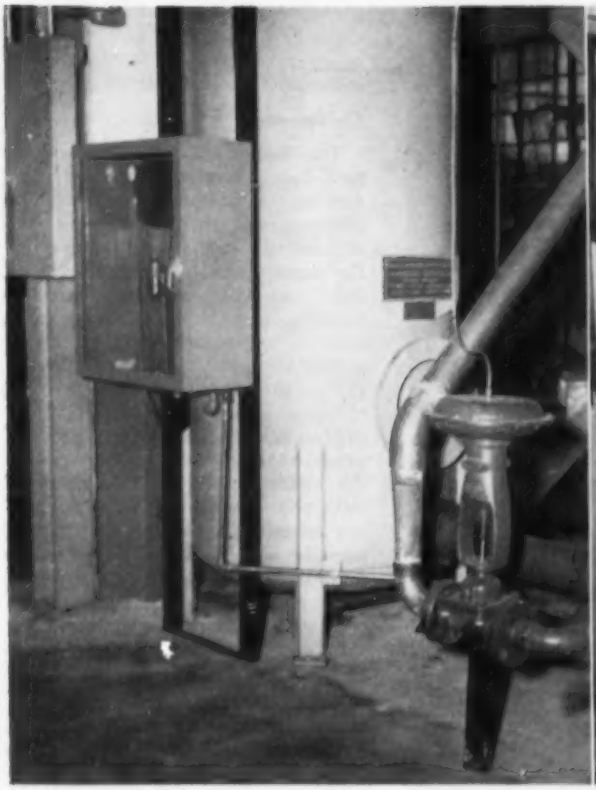


Basic functions of the retention tank are to insure air saturation, complete flocculation, and remove excess air.

Engineer adjusts retention tank controls. Panel contains both inlet valve pressure control and flocculent meters.

Put Dissolved Air to Work...

I&P EXCLUSIVE

...if you have a waste disposal problem, or if you need the economic benefits provided by recovering valuable suspended or colloidal materials from process liquors.

CHARLES E. NAPIER
Charles E. Napier Co., Ltd.
Toronto, Canada

IN INDUSTRY TODAY, there is a great deal of talk about cross fertilization of ideas. Often a good idea or a process that has found wide and successful use in one industry can be readily adapted to other industries with great advantage. Such an idea, the use of dissolved air to separate solids from liquids, or to separate oil and grease from water, is now finding application in a wide range of vertical industries from chemical processing to meat packing — in situations where stream pollution must be avoided or where valuable raw materials must be recovered from process wastes.

Applications

This method, named the Colloidair Process, was designed only a few years ago by Bulkley, Dunton Processes, Inc., to recover valuable pulp and other ingredients in the white water effluent from paper mills. Then after considerable experimentation and development, the system began finding use for cleaning up waste waters from oil refineries, oil fields, soap plants, meat packing plants, airplane manufacturing plants, and general machining operations. These applications are possible because, besides removing suspended material, the process can recover colloidal materials such as oil and carbon.

Currently, the list of industries and plants that have adopted the process to wage a war on waste and inefficiency, or to steer clear of stream pollution or both, is growing rapidly. The reason — alert managements are becoming aware that it's smarter and cheaper to police themselves on stream pollution than to become involved in complicated wrangles with Federal, State, Re-

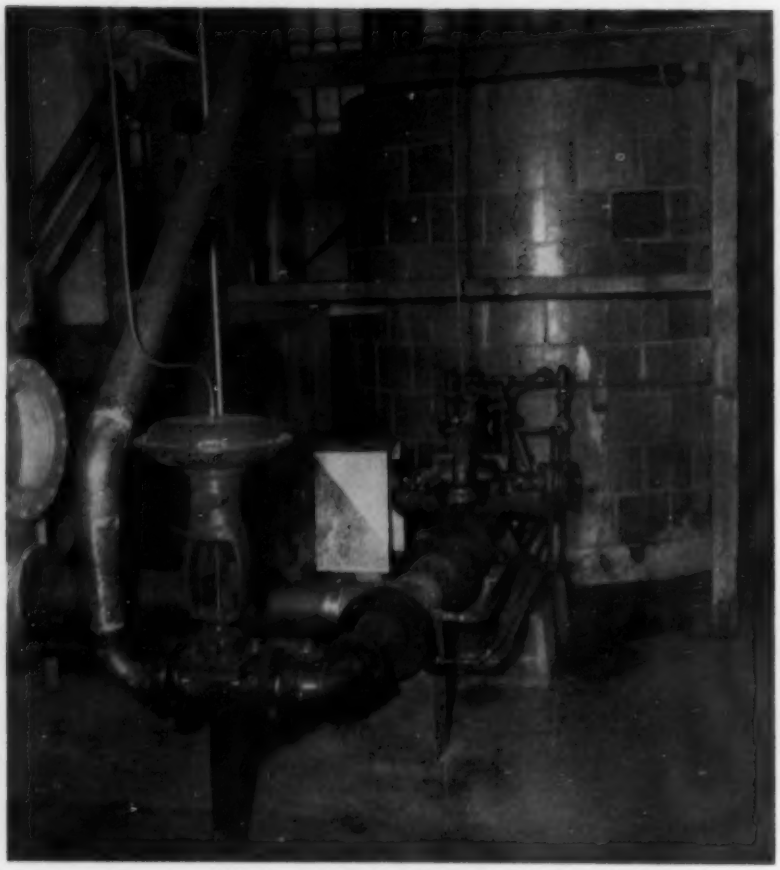


Photo shows the surge tank, process pump, and air-actuated flow control valve.

Clarified effluent flows through vertical risers into the clear water chamber.

gional, or County authorities. Also, discarding valuable raw materials or by-products with waste effluents is simply throwing money away.

Quiescence

The secret of the dissolved air technique's economic and technical success is quiescent and efficient performance. Before dissolved air, diffused air systems were used for the same purpose. But such processes were hampered by turbulence, frothing, and low density float—none of which occur with the dissolved air process. In the Colloidair system, air is introduced into the flow of waste liquid and dissolved under pressures above 25 psig. When the pressure is released, bubbles rise to the surface as they do in a bottle of soda pop. Chemical coagulants also are introduced into the system, especially with colloidal materials, to promote flocculation. This arrangement provides high separation efficiencies at minimum cost.

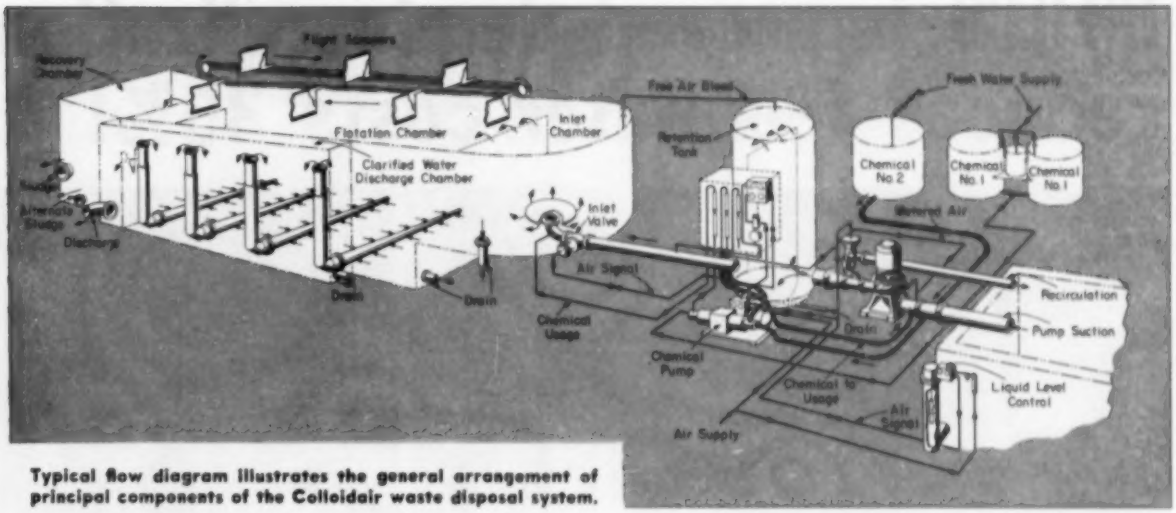
Space Requirements

One of the primary features of the unit is its minimum space requirements. Low operating depth and open tank design permit erection within buildings and structures at any floor level, and outdoor installations also are practical in many instances. Units are available to handle flows from 72,000 to 3,000,000 gallons per day, the 72,000-gpd unit requiring a space approximately 13-ft long, 8-ft wide, and 4-ft 7-in. high; the 3,000,000-gpd unit requiring a space approximately 54-ft long, 14-ft wide, and 5-ft 7-in. high.

Operating Cycle

At most installations, waste effluent flows from the process to a collecting basin or tank of suitable dimensions. From this point, a pump sends it through a flow control valve to a closed retention or dwell tank, which is divided into two sections by a vertical baffle plate. The functions of this tank are to insure air saturation, to complete flocculation, and to remove excess air. This excess air is released and bled from the closed tank as the water passes over the baffle. At the same time the desired pressure is maintained, regardless of flow variations, by an automatic air-operated control valve located in the line discharging from the retention tank into a separator.

Wastes flowing through the pressure control valve pass into a degasification and stilling chamber, and are distributed across the inlet section of the flotation tank at a predetermined level. From this point on, all



Typical flow diagram illustrates the general arrangement of principal components of the Colloidair waste disposal system.

of the remaining steps in the process are visible including: the chemical flocculation, degasification, particle separation (or grease collection), suspensoid float collection, positive removal and compaction of the float mat on the recovery apron, and the discharge of the clarified effluent in the clear water chamber.

Flotation

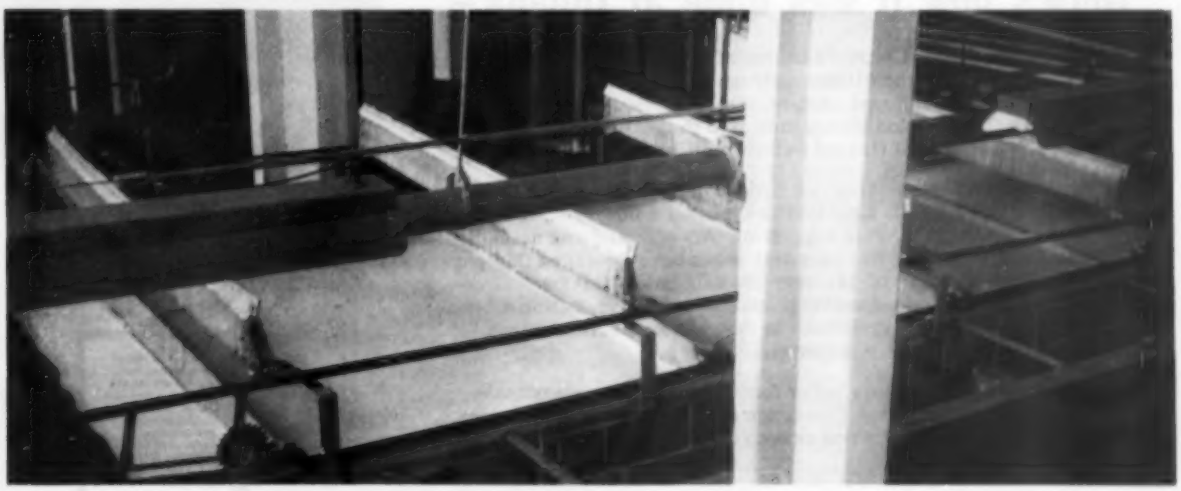
Flotation is accomplished by releasing the air from solution. The buoyancy of the minute air bubbles, which are physically attached to the flocculated particles, has the effect of lowering the specific gravity of these particles while conveying them to the surface of the flotation tank. This occurs over the entire area of the separator, resulting in non-turbulent, uniform flotation. The equipment maintenance problems encountered with vacuum deaeration procedures are avoided through pressure dissolving of the air since ultimate leakage of the air to the atmosphere is the desired effect.

Separator Functions

Grease and solids floated to the surface are continuously pushed by flight scrapers toward the recovery trough at the far end of the separator. Properly adjusted scrapers do not dip into the body of the liquid. Thus, the liquid is not disturbed. Sludge is collected in the recovery chamber and periodically removed. Meanwhile, clarified effluent flows continuously from the bottom of the flotation chamber through uniformly-spaced recovery tubes with adjustable height risers, and discharges into the collection trough for reuse or disposal.

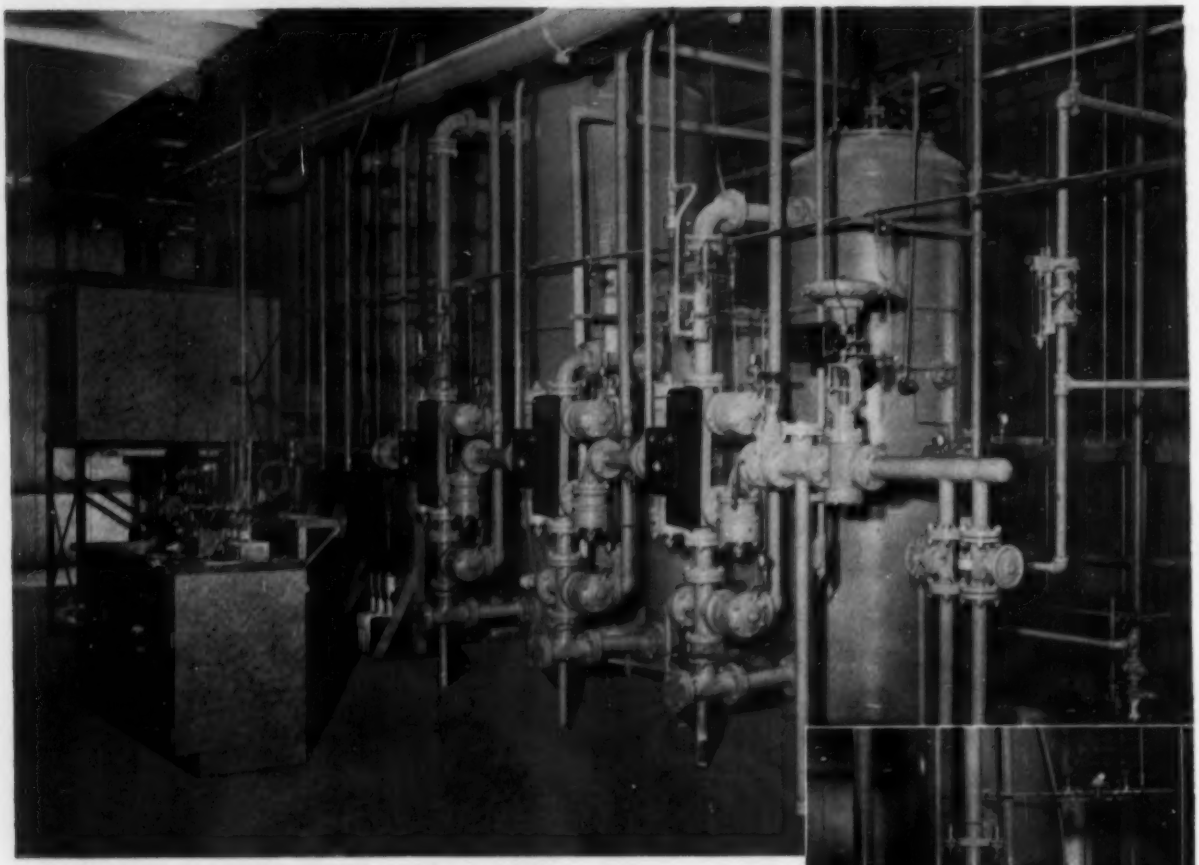
Advantages

The entire process occurs in a treatment cycle of approximately 20 minutes for most applications, as opposed to one to four hours required for other methods of clarification. The net result is a reduction in floor area requirements, which today represent a cost of from 50¢ to $2.00 per square foot. At many plants the recovery of valuable raw materials or by-products from effluents permits amortization in less than a full year's operation. In other instances, the avoidance of penalties for stream pollution violations or the avoidance of a bad reputation make the use of dissolved air for waste clarification well worth-while.



Flight scrapers continuously traverse the surface of the separator and move flocculated wastes to the recovery chamber.

INFILCO improved demineralization reduces feedwater costs 35%!



INFILCO Demineralization Plant installed at the North Omaha Station.

Close-up of "CATEXER" ion exchange unit.

Here's how it was done at Omaha –

Omaha Public Power District's source of feedwater make-up for 1500 p.s.i. boilers is the Missouri River. This water has high and extremely variable mineral content. Their previous experiences with two-bed demineralization plants indicated that the average chemical cost per 1,000 gallons of treated water would be approximately 40¢.

In considering the water treating requirements of the new North Omaha Station, INFILCO Engineers suggested a new type, four-bed demineralization plant. This suggestion was accepted and actual operations have shown the chemical costs have averaged 26¢ per 1,000 gallons—a saving of 14¢ over the original estimates. In addition, this *fully-automatic* plant initiates regeneration when required, regardless of variations in raw water mineral content, without sacrificing treated water quality.

If you have a high pressure boiler feedwater problem, CATEXER® ANEXER® Demineralization Plants are sure to offer an economical solution. Write for information or see your Consulting Engineer.

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The one company offering engineered equipment for all types of water and waste processing—coagulation, precipitation, sedimentation, flotation, filtration, ion exchange and biological treatment.

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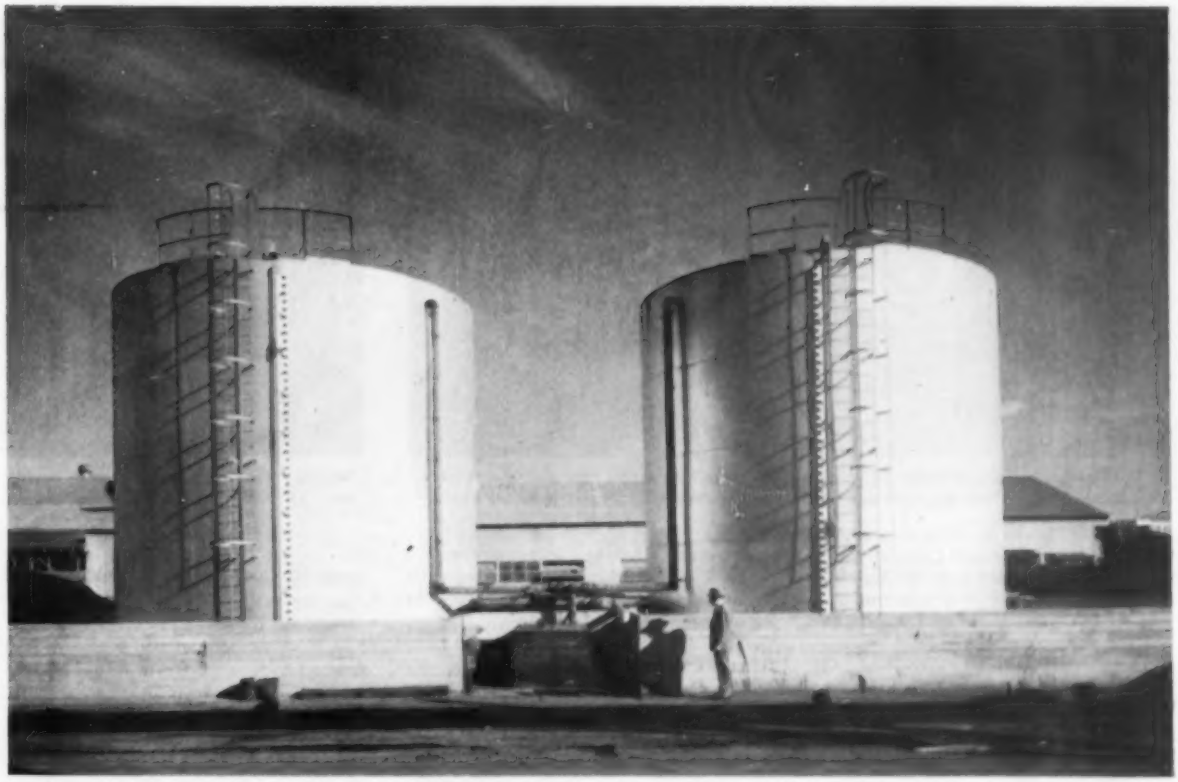


Two 100,000 gallon fuel oil storage tanks with unloading stations appearing in the foreground. The steam heated pump housing is in the center of the picture with valve reach rods all extending to a central operating position.

Electrically Heated Pipelines

Keep Fuel Oil Flowing

I&P EXCLUSIVE

All plant engineers faced with the problem of handling viscous fuel oils will be interested in the methods used at the Judson Steel Corp. to maintain pipelines at the proper temperature to prevent clogging of the lines carrying viscous fuels.

JOSEPH B. WYLIE, General Supt.
Judson Steel Corp.
Emeryville, California

JAMES C. HARRIS, JR.
Heat and Control, Inc.
San Francisco, California

THERE ARE two distinct systems for handling fuel oil at the Judson Steel Corp. The first system takes care of three open hearth furnaces which must be supplied with a continuous and uninterrupted supply of fuel oil at all times. The open hearths are presently fired only with fuel oil and are located a considerable distance from the mill.

The second system is for standby feeding of one ingot heating furnace and one billet reheat furnace. The two furnaces, normally fired with gas, have a standby fuel oil system which may be called into operation at any time for intermittent or continuous operation, depending on the availability of the gas supply. No. 6 fuel oil is used in both systems. Each is

Overhead 3 in. electrically heated fuel oil lines run along the outside of the building. These fuel oil lines are heated with wrapped around heating cable.

Standby fuel oil service pump, heaters, starter are shown at left.

separate and distinct in its function and is designed for a minimum of operating attention and maintenance of component parts.

Open Hearth System

Two 100 000 gallon fuel oil storage tanks are installed within retaining walls as required by the local fire regulations. These tanks are approximately 600 ft away from the open hearth building. A 10,000 gallon fuel oil service tank is located adjacent to the open hearth building.

Fuel oil is delivered to the tank farm in railway tank cars and is usually warm enough to pump without additional steaming. However, steaming connections are available at the railroad siding locations, and, at times, they are used. The discharge lines and steam line are in a concrete trench, thus maintaining this oil in a fluid condition regardless of outside temperatures.

A Bryant, 15 hp, gas-fired automatic boiler provides the necessary steam at 10 psig. It is equipped with a hot well and automatic feedwater makeup for the boiler.

Pumps

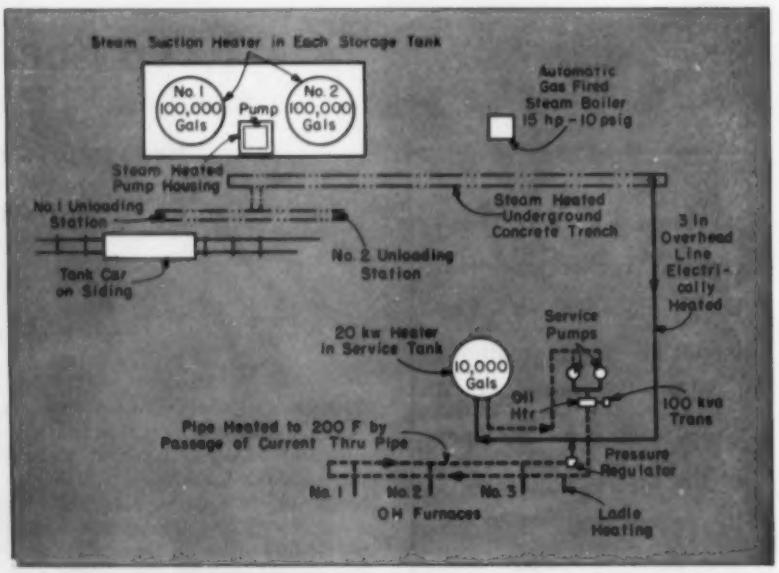
Two Rotary Roper pumps, each with a capacity of 37 gpm, are installed so that either pump may take its suction from a tank car or a storage tank. All of the fuel oil piping (4 in. suction — 3 in. discharge) is traced and insulated (or boxed) so that the fuel is kept in a fluid state in the pipelines. A part of the discharge line from the pumps to the service tank is in a steam heated concrete trench and part is overhead. The overhead lines are kept at 100 F with electric heating cable having a thermostat control.

Each storage tank is equipped with a steam coiled suction heater to heat the fuel oil from minimum temperature conditions to 120 F — to allow it to be pumped from the storage tanks to the service tank at the rate of 37 gpm.

"Start-Stop" pushbuttons on the open hearth charging floor control the filling of the service tank. This tank is equipped with a float switch and an electrically operated valve which prevents overflowing in case an alarm device fails to attract the operator's attention.

A 20 kw immersion electric heater, equipped with a thermostat and magnetic contactor, is installed in the service tank and maintains a minimum temperature in the tank of 130 F. This temperature allows the fuel oil to flow easily to either of two fuel oil service pumps that are installed in the fuel heater house below and adjacent to the fuel service tank. These pumps are each rated at 11 gpm and 300 psig. They both have over pressure relief valves. Each of the pumps is valved so that either can take its suction from the service tank and pump oil through the fuel oil heater to the service loop.

The oil suction line (2 in.) that leaves the service tank and the pump



This fuel oil system provides a continuous supply of fuel to the open hearth furnaces and is designed for minimum operating attention and maintenance.

discharge line and service loop (1½ in.) are electrically heated and use thermostat controls. The heat is provided by passing low voltage, high amperage current directly through the pipes carrying fuel.

Fuel Oil Heater

The fuel oil heater is unique. It is an 80 kw, 3 phase heater made up of 1½ in. pipe through which is passed low voltage high amperage current. The velocity of fuel oil through the heater is approximately one foot per second. The watts density on the pipe is less than 7 watts per square inch. Average operating conditions require approximately 40 kwh per hr with an average oil flow of 6 gpm.

The temperature of the fuel oil leaving the heater is maintained at 200 F with a Brown potentiometer temperature controller through a magnetic contactor and 100 kw, 440 volt, primary 3 phase transformer. All pipelines are insulated to keep heat loss at a minimum.

It is interesting to note that after five years of constant operation it has not been necessary to clean the heater. Inspection has shown the insides of the pipes to be clean and free from any deposits.

Fuel pressure in the service loop is maintained at a nearly constant 250 psig through the use of pressure regulators. Fuel which is not used in the service loop is returned to the fuel service tank where it mixes with the stored supply. The service tank is purposely not insulated to prevent any undesirable buildup of temperatures in the tank.

Standby Fuel System

An insulated 10,000 gallon fuel oil storage tank is located 150 ft away from the rolling mill. No steam is required to unload the No. 6 fuel oil delivered to this storage tank by truck. Under and adjacent to the storage tank is a rotary circulating pump capable of delivering 15 gpm at 200 psig. This pump is equipped with a pressure relief valve.

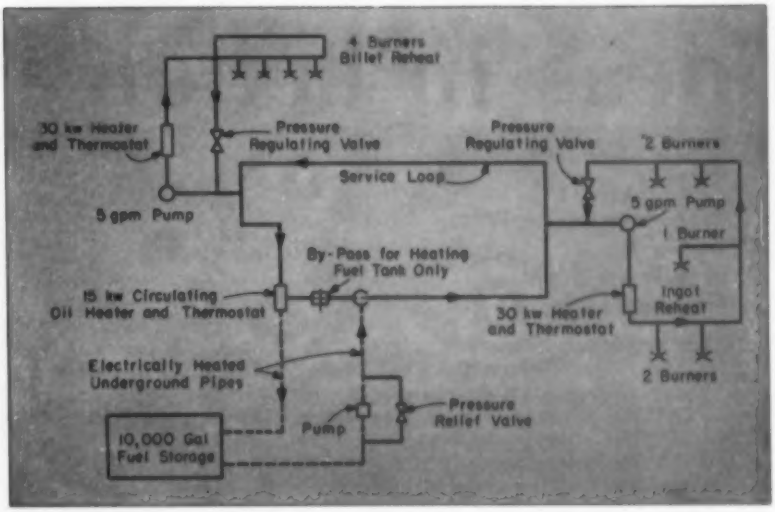
A 1½ in. fuel service loop leaves the pump, runs underground through an electrically heated line for 150 ft, rises, and circulates to the ingot heating furnace. The service loop continues to the billet heating furnace and then to a 15 kw circulating type, thermostatically controlled, oil heater. The loop returns through a parallel underground electrically heated pipe back to the storage tank.

When tank and pipelines are cold, it requires approximately eight hours to bring this system into a ready condition. However, by constantly circulating fuel oil in the loop, fuel oil is always ready to take over in case of gas curtailment.

A 5 gpm, 200 psig pump, with its own pressure regulating valve, is located at each furnace. The pumps force the fuel oil through a 30 kw electrically heated, thermostatically controlled, circulating oil heater which maintains the fuel at 200 F in the furnace service loop.

When the word is passed to shift over to fuel oil, hot, 200 F oil is ready at the manifolds by the time the oil burners can be inserted in the burner ports of the furnaces.

In designing the fuel oil handling system at the Judson Steel Corp., care was taken to assure positive suction pressures and suction temperatures, to preclude the possibility of gas binding due to gas formation in the oil. Both the systems, in spite of using a fuel oil with a high viscosity, have operated several years with a minimum of attention and maintenance. The normal troubles were eliminated by proper design.



The standby fuel oil system may be called into operation at any time for intermittent or continuous operation of two furnaces normally fired with gas.

Fuel oil heater room and controls are seen through the door. Insulated heated fuel oil suction line and service loop are suspended from the pipe hanger.

ideas in action

. . . in U. S. industrial plants

Hospital Power Supply Safeguarded by Standby Diesel

By severing power lines, a hurricane, enemy air attack, or other major disaster could knock out a hospital at the very time it is needed most. Operating room lights would be blacked out, X-ray machines, fluoroscopes, electric sterilizers, physio-therapy apparatus, iron lungs, and other key equipment would be rendered useless.

In June of 1954 a failure in the Plattsburgh, N. Y. electrical power system shut off all power to Physicians Hospital. A 15-kw Fairbanks-Morse diesel-generator set, in operation at the hospital since 1949, automatically cut in and supplied power for one light in each of the four operating rooms and for the oil burners and water feed pumps in the hospital's boiler room. Within 5 minutes, assistant engineer Glen Robbins, who had been out of the building at the time the power failed, had a 500-hp Fairbanks-Morse standby diesel engine on the line at full load. The standby unit furnished power for the 20 min. necessary to correct failure in the city system.

To guard against just such an emergency, Physicians Hospital had recently constructed a small power station at the rear of its main building, installing the F-M diesel as a standby unit. The engine was put on the line on January 1, 1954 and is run weekly to check operation.

The hospital's new standby plant also protects it against the inadequacies or failure of hydro power,

Small plant on grounds assures power in emergency.

which is the chief source of energy in this section of northeastern New York. When water supply is low during the summer, early fall, and late winter months, the local Plattsburgh Municipal Lighting Department, which purchases power from a four-station hydro-electric plant on the Saranac River and distributes it throughout the city of Plattsburgh, must supplement the decrease in hydro production with power from its own 3236-kw standby diesel plant. With a peak demand — which exceeded 9700 kw in 1953 — this municipal plant cannot supply all of its customers in the event of a complete hydro failure — approximately two-thirds of the city would be faced with a blackout.

The 500-hp power unit, larger than necessary for current peak loads, was installed to provide extra power for the emergency fire pumps and to allow for future expansion of facilities at the hospital besides furnishing emergency power.

Ultrasonic Analyzer Anticipates Future Failure of Materials

Armed with knowledge of the interior structure in a given material, technical specialists can now anticipate how such material will perform at future intervals. At Vibro-Ceramics Corp., a Gulton Industries affiliate in Metuchen, N. J., an instrument, known as the ultrasonic attenuation analyzer, has been developed which

Information on future behavior of material is derived from observing pattern on cathode ray tube (right).

makes it possible to determine internal changes of structure in most solids and some liquids where no apparent changes show on the surface, or to detect flaws and irregularities inside that can make the difference between good and bad performance by such materials.

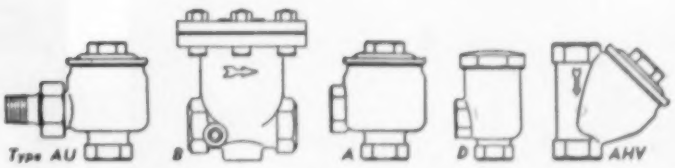
By means of the information developed by this testing device, industry may be able to prevent accidents through detection of material flaws, prevent waste in equipment by exploiting its life cycle to the maximum, and set up schedules for both equipment and component changes at the exact time needed.

The analyzer operates by placing a small transducer against the material to be tested. The transducer, an instrument which converts an electric current into mechanical energy, beams a short ultrasonic signal through the material. The analyzer then records the return pulses reflected by the materials for comparative information.

The ultrasonic analyzer measures the effect of the structure upon the ultrasound as it traverses the material and permits comparison with data obtained from

NICHOLSON Steam Traps'

1. Initial Cost
2. Upkeep Expense
3. Warm-Up Time
4. Production Time



SIX TYPES FOR EVERY PROCESS, HEAT, POWER USE

¼" to 2" sizes for pressures from vacuum to 300 lbs. Bronze, monel or stainless steel bellows. Bronze, semi-steel or cast steel bodies.

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Sales and Engineering Offices in 53 Principal Cities

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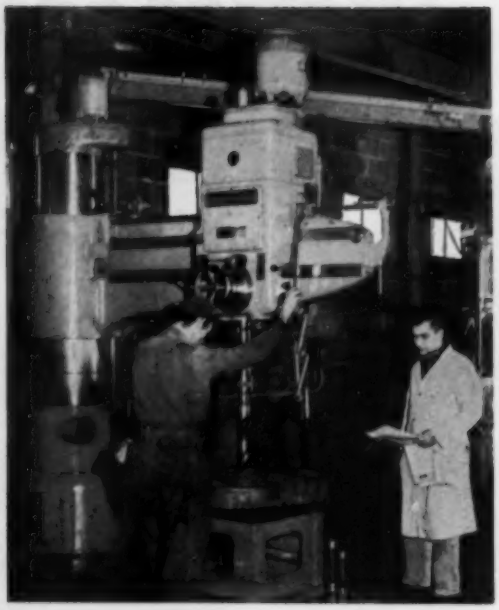
PRESS BRAKE

PRESS BRAKE, 400 Ton capacity, for forming and bending. Also equipped with demountable bed and ram flanges for gang punching or heavy progressive die work.



Our Modern

RADIAL DRILLS

RADIAL DRILLS, for heavy duty, high speed drilling, reaming, tapping, counter boring and similar operations. Automatic clamping of arm on column assures accuracy without expense of jigs.

Heavy Equipment Saves You Money

SQUARING SHEAR

SQUARING SHEAR, ¾"x10' capacity, for accurate blanks. Also equipped with adjustable ram for notching and slitting special shapes of unlimited lengths. Micromatic adjustment screws permit close-tolerance setting of blade to insure true 90° cut.

GEARED HEAD ENGINE LATHE

ENGINE LATHE, 30 inch swing by 25 feet between centers, with two compound tool-rest carriages. Motor-driven taper attachment on each carriage, which allows turning of continuous tapers along entire length of the machine.

designers and fabricators of precision steel weldments

ST. JOSEPH, MICHIGAN

THE foster COMPANY

Circle 527 on Reply Card for more data

For combustion testing in the field!

HAYS ORSAT TYPE
GAS ANALYZER

The first of its type developed for field work, the Hays Analyzer answers the need for an Orsat type gas analyzer husky enough for use in the boiler room and for installation and service work in commercial and home heating plants, yet simple, fast and accurate!

It's Rugged—Made with strong pressed steel, the Hays Orsat is designed for continuous boiler room operation and field work . . . takes wear and tear in stride!

It's Portable—The Hays Orsat contains everything needed for *complete* analysis (CO_2, O_2, CO) in one light (only 8 lbs.), easy-to-carry case . . . goes wherever it's needed. Compact, with all parts easily accessible.

Available in one, two or three unit styles. Does a complete testing job for CO_2, O_2 and CO in 3 minutes!

Send for publication 54-668-27—a complete description of all styles.

Automatic Combustion Control
Boiler Panels • CO_2 Recorders
Venturi Meters and Venturi
Gas Analyzers • Draft Gages
Combustion Test Sets
Electronic Oxygen Recorders
Electronic Flowmeters
Electronic Feed Water Controls
Miniature Remote Indicators

THE hays CORPORATION

Michigan City 2, Indiana

Circle 528 on Reply Card for more data

ideas in action

—Starts on page 66

other similar materials of a fixed or known standard.

For instance, in the production of ceramics it is possible to reconstruct the entire production pattern through measurement of attenuation at various locations on the surface of the material in question, enabling the manufacturer to improve the quality and uniformity of the ceramic through better production techniques.

The instrument has also been used to measure plastic strains of metals. As a given piece of metal is subjected to repeated or continuous strain, the attenuation and velocity of ultransonic pulses is modified during successive tests. By applying frequent measurement to metal elements of a structure suspected of fatigue, the beginning of plastic strains can be detected before the strains become critical.

In its development to date the attenuation analyzer has several basic limitations. The sample for testing must have flat and parallel faces. If the material does not have such surfaces, they must be prepared by machining. The sample must be sufficiently thick to prevent the leading edge of the ultrasonic pulse from overlapping its own trailing edge at the input boundary or surface. It is recommended that the sample be at least ¼ in. thick, and the ideal range is from ½ to 2 in. Thicker samples—5 in.—give impractical information at the present status of development, but in time this upper limit may be extended through design refinement.

The biggest potential in industry for this system of material analysis will probably be in the field of trouble shooting and preventive maintenance. All equipment under constant and heavy use in factories, or under any type of stress such as moving parts of automobiles, trains, and aircraft can be watched for progressive development of deficiencies.

In manufacturing processes, the analyzer can inspect materials before they enter into the final finishing steps, thereby eliminating costly rejects. It can be useful for inspecting crystals or metals for uniformity of structure, particularly those having critical functions under pressure, high temperatures, wear, fatigue, chemical attack, or other stresses.

Considerable experimentation is still needed with the device to establish the optimum measuring standards for various materials, as well as determining how internal changes—such as decay, deterioration, and fatigue—may affect propagation characteristics of ultrasound.

Plastic Panels Replace Glass for Better Daylighting

Quantity and distribution of daylight reaching the work floor at the Fulton Iron Works Co., St. Louis, Mo. plant left much to be desired. The light was admitted into the 440 ft building through a continuous stretch of sash and glass panes at roof height. To cut down glare and heat, windows in some sections of the plant were painted over. Light reaching the work floor was dim and the framework cast shadows over the working area. Added to unsatisfactory lighting was the cost of replacing broken panes.

After investigating cost of additional lighting fixtures, Fulton initiated a glazing replacement program, the first step of which has been replacement of glass on the west

HOW TO BUY V-BELTS

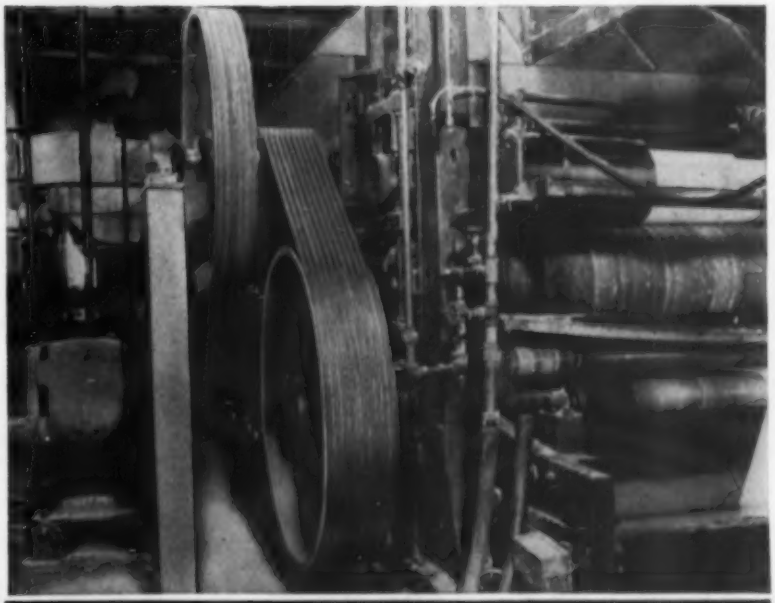
FOR TOUGH, RUGGED DRIVES

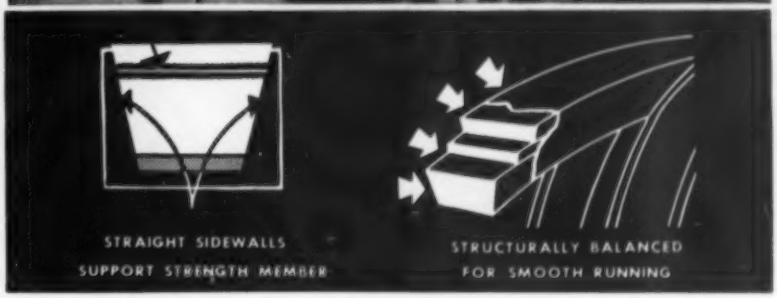
. . . and get "More Use per Dollar"

Look for a V-belt construction that provides longer life under shock loads . . . extra strength with the use of the right synthetic strength member.

Precision balance of all parts of the V-belt makes for a smoother running drive, fewer matching problems . . . and longer life for all belts on a multiple drive. Belt strength members of super-strength cords should be correctly positioned in the neutral axis section of the belt so as not to stretch or compress unnecessarily as the other parts of the belt are flexed in use. Straight belt sidewalls help support strength members in a straight line, permit all cords to pull equally . . . deliver their full share of power. You get more grip, less slip because the belt presses tightly against the sheave grooves when rounding pulleys.

Specify by name the V-belt engineered to give you extra strength and extra pulling power . . . specify R/M Super-Power V-Belts.





R/M SUPER-POWER V-BELTS

With these superior V-belts you get up to 40% more power capacity, or fewer belts can be used on the same drive, thanks to R/M's new synthetic super strength member. They provide greater elastic resistance to shock loads and permit virtually no stretch. R/M Super-Power V-Belts are oil-proof, non-spark, heat resistant. You get the balanced combinations of features you need for more power on rugged multiple drives. Let an R/M representative show you how R/M Super-Power V-Belts, as well as Condor V-Belts, last longer on the job . . . give you "More Use per Dollar".

RM-512

R/M

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RAYBESTOS-MANHATTAN, INC.

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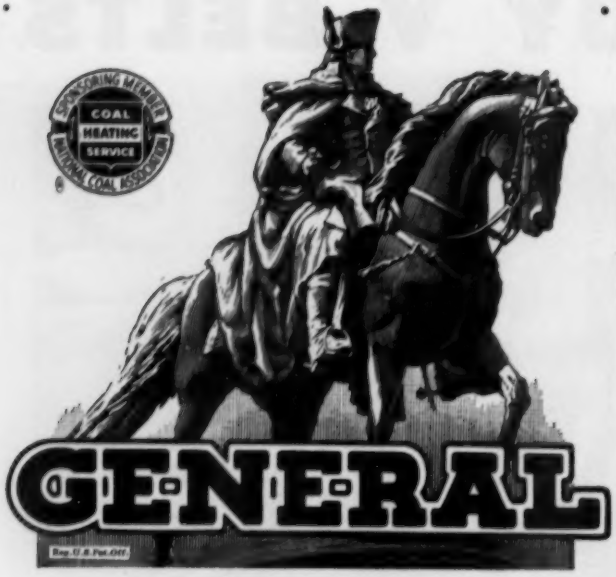

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ideas in action

—Starts on page 66

side of the building with a glass fiber reinforced plastic made by Alsynite Co. from a paraplex polyester resin produced by Rohm & Haas Co.

To form the glazing section, six sheets of laminate — each 12 ft high, 26 in. wide, 1/16 in. thick, and having 2½ in. corrugations — were assembled into section 12 ft sq. These light-transmitting sections were alternated along the entire building with sections of pressed cellulose panels, also 12 x 12 ft. The plastic is tinted light green to provide a pleasant, steady daylight effect.

The new glazing was easy to install. After the old sash was removed, two 5/16 in. steel studs were welded on

Difference in illumination from plastic glazing (left) and conventional glass (right) is apparent from lighting on vertical columns on sides opposite to windows.

4-in. centers at the top and bottom of the exposed building framework. The panels were then mounted on the studs with corrugated rubber strips on both sides of panel and calked along the edges to make them watertight and vibration-free.

Although the light-transmitting area is cut in half, the lighting is more effective since it is glare-free and shadowless and uniform throughout the plant.

"Electric Governor" Provides Accurate Control of Prime Movers

Recognizing the need for more accurate control of prime movers, Westinghouse Electric Corp. and the U.S. Army Corps of Engineers have jointly developed an "electric governor" that is said to be capable of controlling output of engine-driven generators more accurately than any previous means of control.

The device achieves its high performance by sensing even the slightest variation in a generator's output frequency — the number of times per second that alternating current makes a complete cycle — and making necessary corrections in power source driving the generator.

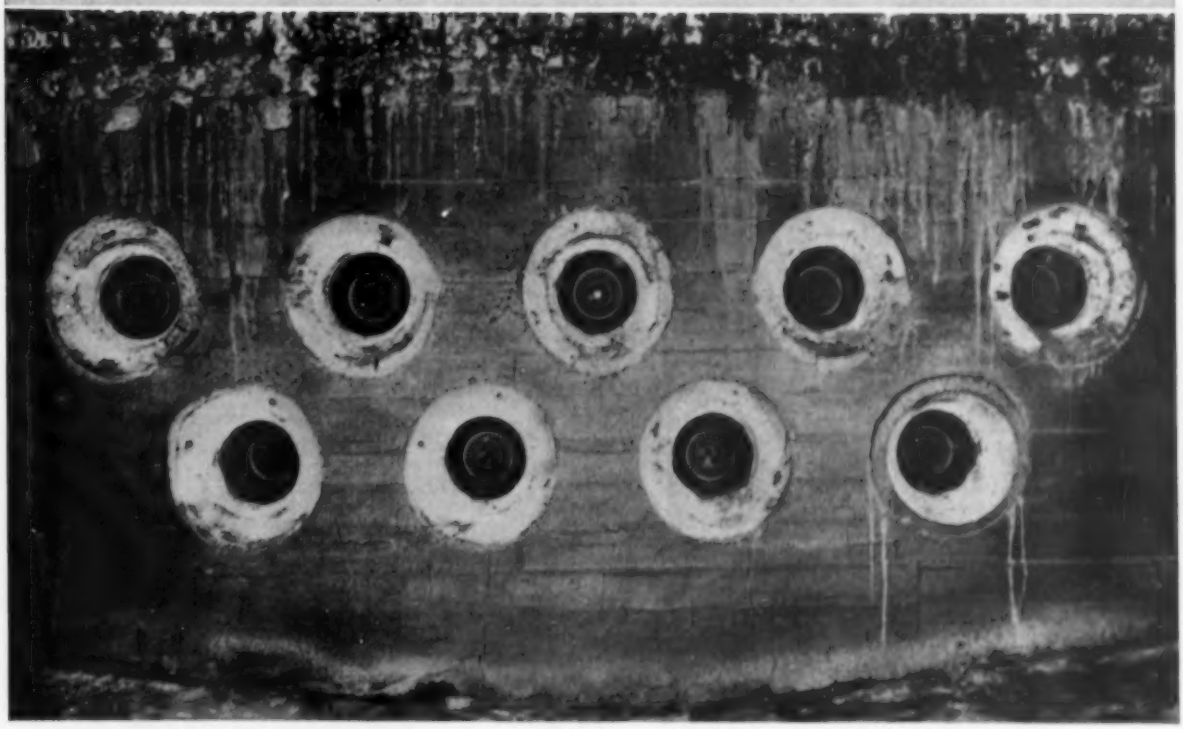
The heart of the unit, a small signal-sensing device called the magnetic amplifier, is rugged, dependable, and has no moving parts.

The electric governor is made up of two basic elements — a control panel and a hydromechanical throttle

(Continued on page 86)

Longer-lasting boiler wall quickly made with...

REFRACTORY CONCRETE



BURNER WALL in excellent condition after a year of service in a 150,000 lb./hr. steam boiler at station "B," San Diego Gas and Electric Company. This monolithic refractory concrete burner wall is made with TASIL HYDROCAST #401, a 3000°F. castable refractory manufactured by Charles Taylor Sons, Cincinnati, Ohio.

YOU MIGHT EXPECT this front wall to be ready for replacement. Over a year old, it has already outlasted previous burner walls on a 150,000-lb.-per-hour steam generator. But it is made of Refractory Concrete, and it's in such good condition that the form marks are still clearly defined.

Long service like this is typical of Lumnite* Refractory Concrete. Its low volume change and ability to take over 2600°F. heat result in maintenance economies. And consider the other savings:

Less time and labor are needed because Refractory Concrete is placed easily as a monolithic unit... reaches service strength within 24 hours. Special shapes can be cast on demand so inventories of special shapes are reduced. For instance, burner ports here are cast with the base—no special shapes and complicated fitting needed.

You'll find Refractory Concrete excellent for use wherever heat, corrosion or abrasion is a problem. It is readily made with Lumnite calcium-aluminate cement and refractory aggregates.

FOR CONVENIENCE, use a prepared castable mix such as the TASIL HYDROCAST #401 used on the job shown above. Castables are Lumnite Cement plus aggregates selected for specific temperature and insulation service—add only water. They're made by leading refractory manufacturers and sold through their dealers. For more information, write Lumnite Division, Universal Atlas Cement Company (United States Steel Corporation Subsidiary), 100 Park Avenue, New York 17, N. Y.

*"*LUMNITE*" *is the registered trade-mark of the calcium-aluminate cement manufactured by Universal Atlas Cement Company.*

IP-L-98

ATLAS® **LUMNITE for INDUSTRIAL CONCRETES**

REFRACTORY, INSULATING, OVERNIGHT, CORROSION-RESISTANT

A UNIVERSAL ATLAS PRODUCT

UNITED STATES STEEL HOUR—Televised alternate weeks—See your newspaper for time and station

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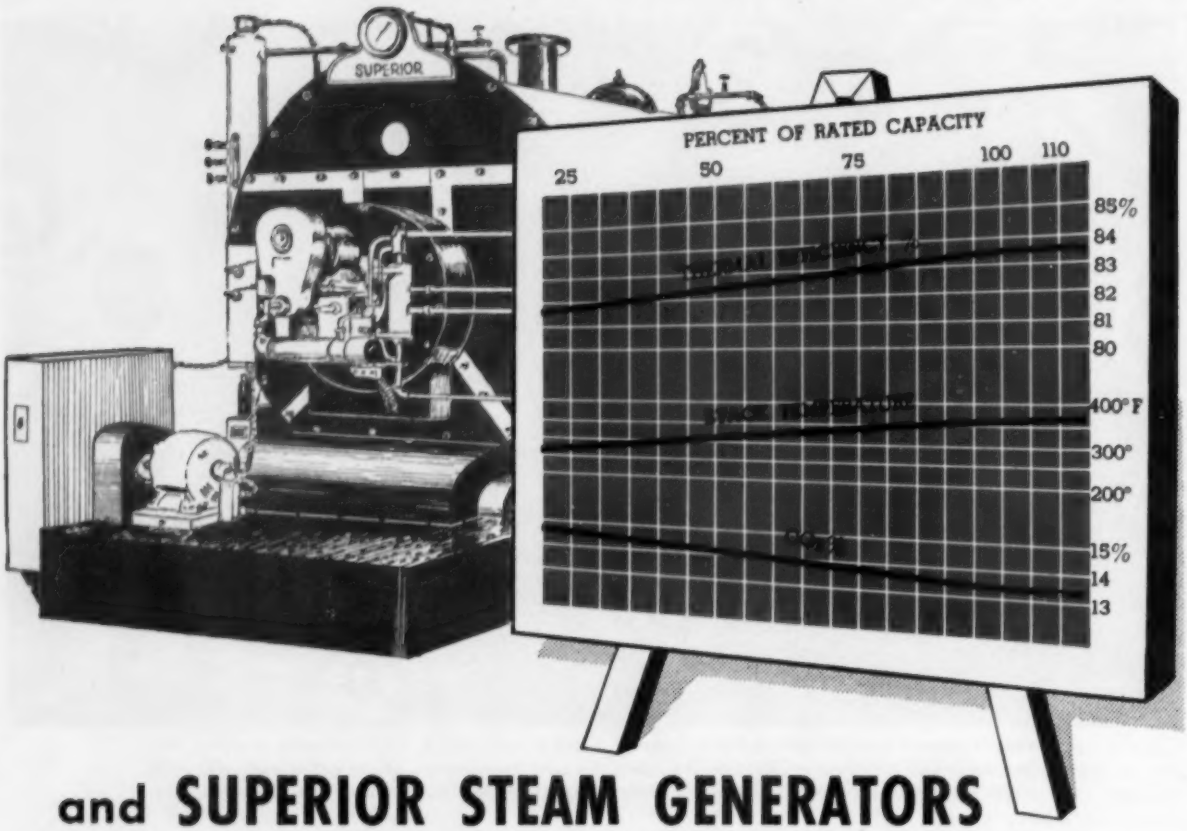
is part of the PACKAGE



and SUPERIOR STEAM GENERATORS are rated for actual operating conditions

Superior Steam Generators are fully automatic, burning oil or gas or both. 18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. Write for catalog 702.

The payoff in performance is in your plant—here is where a steam generator must live up to the claims of its maker or you are the loser. Every Superior Steam Generator is "Performance Rated" on the basis of tests conducted under conditions duplicating those of actual service and is guaranteed on the results of these tests. The chart above shows typical performance of a Superior Steam Generator at 100 lbs. pressure. It is based on tests conducted by professors from Lehigh University on a boiler which had been in actual service for over a year. You can depend on results like these throughout a longer serviceable life when you specify Superior Steam Generators.

for performance you can **BANK** *on*

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

SUPERIOR STEAM GENERATORS

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readers' guide

. . . an index to advertised products

The table below lists, according to product groupings, all equipment advertised in this issue. To request more data, circle key numbers on Reply Cards, pages 34/35 & 74/75

Key No.	Advertisers	Product	Page No.
	AIR FILTERS & DUST COLLECTORS		
534	Buell Engineering Co.	Dust collectors	78
	BOILERS & BOILER ACCESSORIES		
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522	Chesapeake & Ohio Railway	Coal	33
514	Diamond Power Specialty Corp.	Multi-port gage	23
548	Engineer Co., The	Boiler baffles	85
503	Enos Coal Mining Co., The	Coal	6
530	General Coal Co.	Coals	72
500	Hays Corp., The	Controls for package boilers	2
545	Jerguson Gage & Valve Co.	Steam gages	84
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bulletins

. . . for listing of the bulletins just received see page 28

AIR CLEANING & DUST COLLECTION

250—Industrial Dusts

"The Collection and Recovery of Industrial Dusts," 32-page manual 101, discusses various types of dust and techniques used in analysis, lists the factors which influence choice of equipment, and explains operation. Buell Engineering Co., Inc.

251—Pneumatic Systems

"Pneumatic Ash & Dust Handling Systems," seven-page catalog 652, outlines general principles of pneumatic materials handling and explains how this company's products meet the various requirements for each particular application. Allen-Sherman-Hoff Co.

AIR CONDITIONING-HEATING & REFRIGERATION

255—Temperature, Moisture Control

Precision control of air temperature and moisture enable you to manufacture your product in any climate, at any season, according to six-page bulletin 122. The Type "A" air conditioner described, for drying or moistening of air, is shown in typical installations. Niagara Blower Co.

256—Unit Heaters

Catalog CUH 846-A gives the complete story on Grid unit heaters. Catalog BC-1040 describes Grid blast coils for process drying. How the construction of the unit heaters prevents electrolytic corrosion is explained in booklet "Corrosion in Unit Heaters." D. J. Murray Manufacturing Co.

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Turbines & Steam Engines 82
Waste Disposal 82
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257—Woven Electric Heaters

Pre-Fab woven electric heaters are described in folder 1546 which illustrates typical uses and gives application data for this versatile heat source. Pre-Fab Heater Co., subsidiary of Edwin L. Wiegand Co.

BOILERS & STEAM

259—Water-Tube Generator

Completely packaged Water Tube Type D Superior Steam Generator in 17 sizes with capacities from 8000 to 40,000 lb of steam per hr, is described in detail in eight-page catalog 5M-54. Superior Combustion Industries, Inc.

262—Condenser Operation

"Proportioning of Surface Condensing Equipment," 20-page booklet 19B8201, gives the latest data and technical information on problems of power plant engineers. It provides formulae of use in calculating performance of a given condenser. Allis-Chalmers Mfg. Co., General Machinery Div.

263—Boilers and Accessories

"Products and Facilities," 69-page general catalog G-63-A shows representative examples of products manufactured and some of the numerous facilities for producing them, together with illustrations of installations. Babcock & Wilcox Co.

264—Package Generator

Six-page foldout B-3100 describes in detail the Ticosteam package steam generator, a three-pass constant furnace pressure, forced draft, fire tube, horizontal boiler which is fitted with burners of special design permitting use of any desired type of gas or fuel oil. Titusville Iron Works Co., Div. of Struthers Wells Corp.

266—Refuse and Wood Burning

Engineering data concerning spreader stokers installed to burn refuse or wood are contained in 24-page booklet 505. Stationary, manual dumping, power dumping, and traveling grate installations having maximum capacities from 10,000 to 275,000 lb steam per hr are described. Detroit Stoker Co.

267—General Catalog

A wealth of research, engineering, and manufacturing experience, gained since the founding of this company in 1880, is incorporated in the products described in four-page folder. Steam generators, heat transfer equipment, and fittings are shown. Henry Vogt Machine Co.

268—Pressure Equipment

One of the country's oldest manufacturers of equipment and accessories for plants piping steam, air, and gas under pressure, has published catalog 400, covering its line of separators, traps, and boiler trim. A condensation of the information in catalogs 500, 600, and 700. Wright-Austin Co.

260—Boiler Baffle Data

More than 30 boiler-setting plans are shown, with an analysis of how each arrangement of tubes is baffled to meet the specific boiler design, in 20-page bulletin BW-54. Detailed problems in installation of baffles are discussed. The Engineer Co.

261—Water-Tube Steam Generators

Packaged water-tube steam generators, Type MH, furnished for oil or gas firing or both, with automatic, semi-automatic, or manual combustion controls, are covered in detail in 16-page bulletin MH3-54. A dimension table for 13 standard sizes ranging in capacity from 10,000 to 40,000 lb of steam per hr is included with drawings. Union Iron Works.

270—Coal-Burning Installation

"Burning Bituminous Coal the Modern Way," contains 24-pages of case histories from industries of all sizes and types. Engineering survey results for equipment such as boilers, stokers, coal and ash handling units, and automatic controls, include annual fuel consumption and operating costs. Bituminous Coal Institute.

273—Packaged Steam Generators

Construction of packaged steam generators is described in eight-page bulletin 1050. Auxiliary equipment is listed and a blueprint with dimensions of a typical boiler room is given. Ames Iron Works.

274—Tube Cleaners

Bulletin 43 introduces a new geared tube cleaner for removing scale in heat exchanger and condenser tubes of ⅜ to 2½ in. ID. The unit is said to be particularly effective where conditions require low speed and great power. Airetool Mfg. Co.

276—Boilers and Equipment

Sixteen-page bulletin SB-50, "Erie City Boilers and Allied Equipment," describes custom designed steam generators for central station or industrial application. Erie City Iron Works.

277—Flue Dampers

Booklet 1-HEA on curtain type dampers for flue gas control explains what the damper is and does, construction, dimensions, installations, and gives case histories. Heacon, Inc.

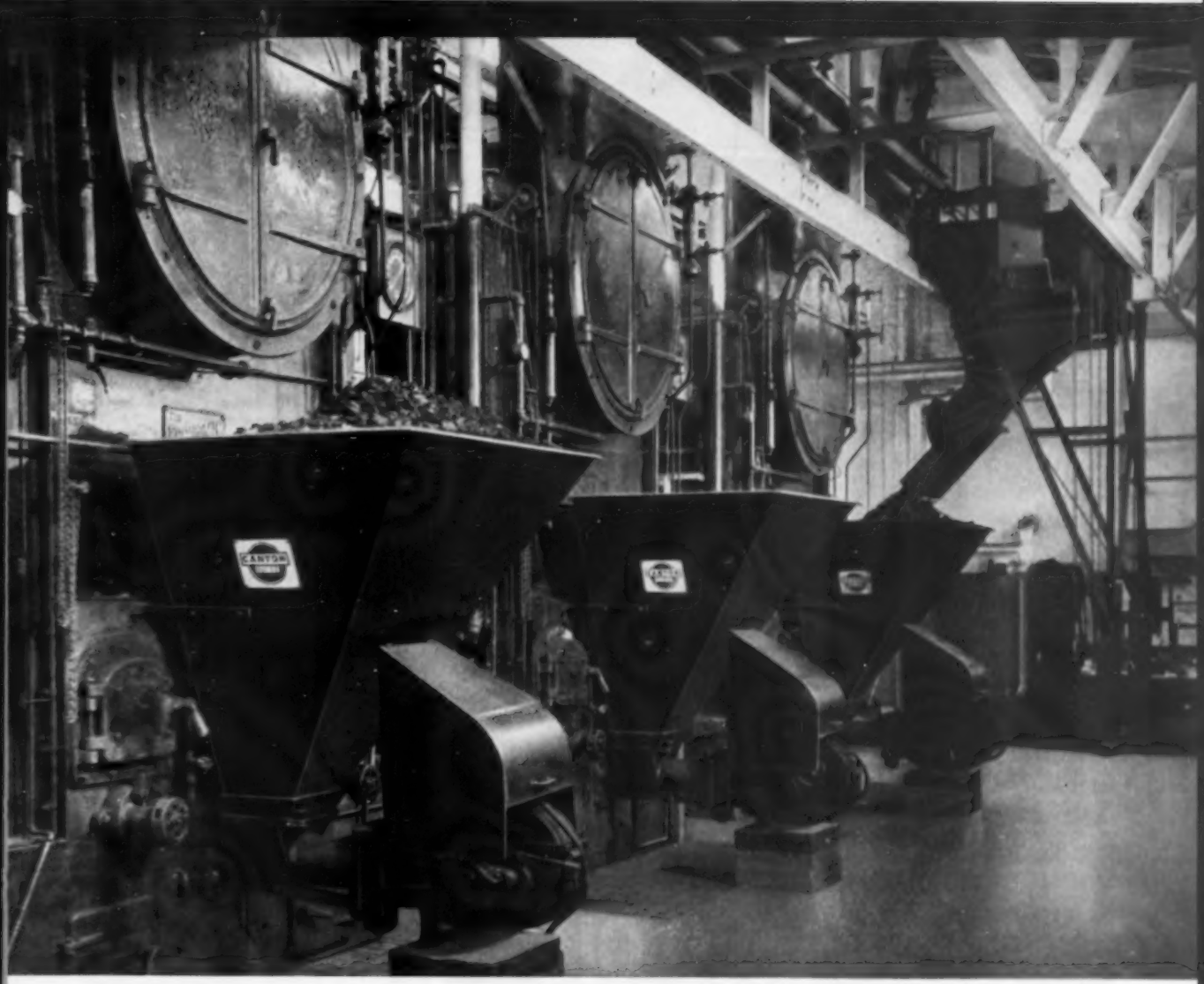
278—Tube Expanders

Rolling and flaring tube expanders and operating accessories are listed in eight-page catalog 68. Illustrations, specifications, and recommendations are included. The Gustav Wiedeke Co.

279—Atomizing Oil Burners

The cheapest grades of oil or tar can be completely atomized and efficiently burned with Type SA steam atomizing oil burners according to 16-page bulletin 21. Models for various special uses are described. National Airoil Burner Co., Inc.

NOTE—Each bulletin has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 74/75.



Burning coal the modern way saves Lakewood Hospital 22% in fuel costs

When Lakewood Hospital, Lakewood, Ohio, recently enlarged its facilities, the hospital authorities decided to install a new boiler plant. After careful consideration, they chose coal.

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Investigate Your Fuel Costs

If you're planning to modernize your plant or build a new one—or if you are just interested in cutting fuel costs—find out how coal, burned the modern way, compares to other fuels. Talk to a consulting engineer or your nearest coal distributor. Their advice may save you thousands of dollars every year.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available.

Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar.

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For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D.C.

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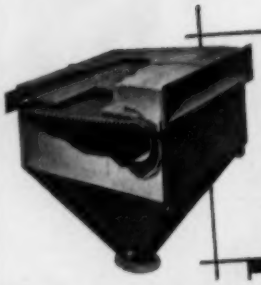
BUELL MECHANICAL CYCLONE SYSTEM



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NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.

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bulletins

—Starts on page 76

280—Soot Blowers

Bulletin 1137 gives complete information on the Model G9B blower which employs a fixed position rotating element to clean a large number of tubes by sweeping through a pre-determined arc. Diamond Power Specialty Corp.

281—Heavy-Oil Burner

Fuel savings is the theme of eight-page foldout AD1131 which describes the new "4" Hev-E-Oil burner. Illustrations show compactness and simplicity of design. Cleaver-Brooks Co.

282—Packaged Steam Generators

Basic construction and design features of plant assembled steam generators, with or without superheat, are presented in illustrated 20-page booklet F6-51-2. Includes tables of engineering specifications for units from 10,000 to 30,000 lb steam per hr and design pressures from 250 to 825 psi. Foster Wheeler Corp.

283—Boiler Baffles

"More Steam from Your Boilers," a four-page folder, explains how streamlined baffles are applied to all types and sizes of boilers. The Engineer Co.

285—Boiler Service Valves

Surface blow, bottom blow-off, water column blow-off, and connections are covered in 22-page bulletin E125, with complete specifications, materials, and dimensions of each type. Valve operation is explained. Everlasting Valve Co.

287—Firing Equipment

Over 50 years of leadership in the manufacture of industrial-commercial firing equipment is reflected in 19-page general catalog 3048. Schematic drawings, layouts of typical installations, cutaway views of burners and burner parts, and photographs are included. Petro Division.

288—Oil & Gas Burners

Advantages of preassembled oil, gas and combination oil and gas burners are listed in eight-page bulletin P-152. Units in sizes from 50 to 900 hp are listed for four common gas pressures and all grades of oil. Coen Co.

289—Package Boilers

Two-drum, bent tube package boilers for steam, and high pressure, high temperature hot water are discussed in a four-page folder. Ratings, data, and dimensions are given in table form. Springfield Boiler Co., Div. of John W. Hobbs Corp.

290—Package Boiler Controls

Specifications for the fully automatic, all electric metering type packaged control for shop assembled boilers are given in four-page bulletin 54-1066-239. Schematic drawing shows a typical packaged control system. The Hays Corp.

291—Remote Reading Gages

Eight-page catalog 246 covers in detail the three standard types of Convex Scale and Flat Scale Truscale Remote Reading Gages, showing how these gages bring liquid level indication down to where it can be seen easily. Jerguson Gage & Valve Co.

292—Check Your Steam Costs

"Have You Checked Your Steam Costs Lately?" This 15-page handbook is a non-

technical presentation of vital interest to everyone considering merits of replacing existing boiler equipment or considering purchase of new boiler equipment for a new operation. Orr & Sembower, Inc.

BUILDING MATERIALS & MAINTENANCE

295—Flooring

"Handbook of Building Maintenance," gives valuable information on keeping your plant in efficient working order. Instant-Use concrete floor patch is described with suggestions for its use, along with data on other materials for repairing floors. Flexrock Co.

296—Repair Cements

Text and illustration in this 48-page handbook present repair methods for leaks in pipes, boilers, radiators, concrete, cinderblocks, and sheet and plate metal. Directory describes 12 repair cements and jobs they will do. Smooth-On Mfg. Co.

297—Standard Fasteners

Savings in cost and in delivery time by specifying and ordering standard fasteners instead of special products are pointed out in 32-page catalog 10M-BP. Applications of each product in the Unbrako Standards line are indicated in line drawings. Diagrams keyed to specification tables simplify measurement references. Standard Pressed Steel Co.

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COMPRESSORS & BLOWERS

294—Aftercoolers

According to four-page folder 1, wet air can be avoided by the simple installation of the Hamilton aftercooler system. Labeled cut-away view shows working parts and explains how the system operates. A complete specifications chart is included. Jas. A. Murphy & Co.

299—Rotary Compressors

Operation and construction of single-stage water-cooled rotary compressors and vacuum pumps, applicable to every air or gas handling requirement, are described in 12-page bulletin 16B8126. It gives general specifications along with typical air piping diagrams. Allis-Chalmers Mfg. Co.

CORROSION CONTROL

300—Transmission Line Corrosion

"Corrosion Control of Electrical Structures and Equipment," 17-pages, is designed to give practical painting information on all phases of transmission and distribution work. Subox, Inc.

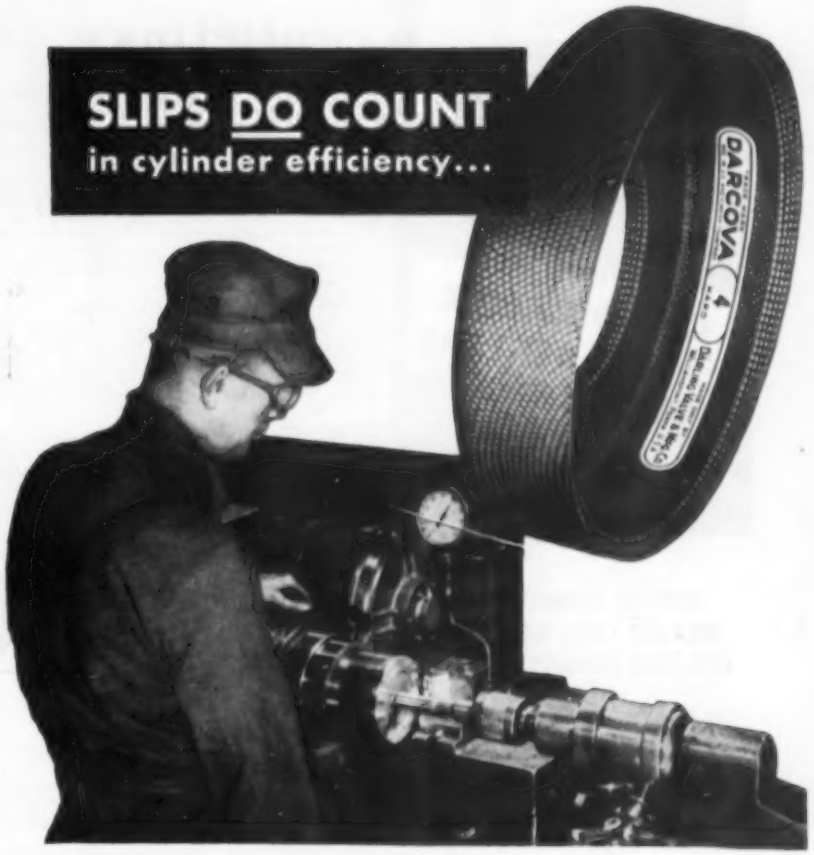
301—Rubber Linings

Application of rubber lining to prevent corrosion of tanks, pipes, and valves is discussed and pictured in four-page folder. In addition, two-page reprint tells how rubber lining can stop circulating pipe corrosion. La Favorite Rubber Mfg. Co.

ELECTRICAL DISTRIBUTION

303—Air Circuit Breakers

Bulletin 5107-DR-1 contains four pages of facts, figures, features, and photographs on types KA, KB, KC, and LG Urelite air circuit breakers, and on weatherproof and dust-tight enclosures. I-T-E Circuit Breaker Co.



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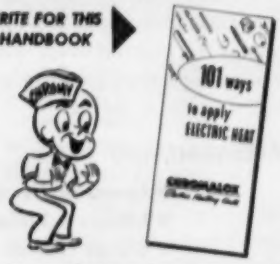

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bulletins

—Starts on page 76

305—Dry-Type Transformers

"Latest Developments in Dry-Type Transformers," seven-page catalog 153-A, presents the advantages of air-cooled units designed and constructed primarily for inside installations. Sorgel Electric Co.

306—Power Factor Correction

Booklet 50B, 27 pages, describes the Unit-Cell Box Type Capacitors which offer easy-to-install, economical means of correcting low power factor for large or small power consumers. Sprague Electric Co.

307—Circuit Breakers

"What You Should Know About Circuit Breakers," 16-page manual 101, explains the operating principles of basic circuit breaker design. Heinemann Electric Co.

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ELECTRIC UTILIZATION

312—Motors

Advantages of the various types of motors made by this company are given in four-page folder 23. Descriptions of single-phase and polyphase motors are included. Wagner Electric Corp.

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"See What Goes On Inside"

For insertion into pipe
FOR EVERY APPLICATION
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FIG. 29 Cylinder with Impeller

FIG. 17-28 Cylinder

FIG. 213 Flanged

FIG. E-57 Double Window

FIG. 212 Visibility Welding Neck or Screw

FIG. E-811 Flapper

FIG. E-1810 Rotating Wheel Type

All sizes up to 6" *Send for Catalog*

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HEAT EXCHANGERS & WATER HEATERS

313—Injection Water Heaters

Steam injection water heaters with the pressurizer piston for safe, quiet, automatic control are described in four-page pamphlet WH12A. How the unit saves space, time, fuel, and maintenance costs is explained. Pick Manufacturing Co.

314—Water Heaters

A streamlined system of heating water and process liquids quickly and at low cost is explained in this bulletin. The Instant Heater described eliminates the need for reducers. Cross-sectional drawings explain how unit operates. Johnson Corp.

315—Heaters

Horizontal and vertical heaters in steel, copper lined, copper-silicon, cement lined, clad and galvanized construction, as well as the low-flow design are each cataloged as to weights, dimensions, construction details, and capacities — with conversion tables, in 48-page catalog 18. The Patterson-Kelley Co., Inc.

INSTRUMENTS & CONTROLS

316—Control Devices

Photos, diagrams, and specifications for key switches, impulsing devices, switchboard lamps, and other control devices are given in 28-page bulletin 4018-D. Automatic Electric Co.

317—Temperature Regulators

Bulletin 330 fully describes a simple, self-operating temperature regulator for plating, anodizing, bonderizing, pickling, cleaning and rinsing solutions. The Powers Regulator Co.

321—Electrical Controls

Redesigned for easy reference, catalog 54 commemorates this company's fortieth anniversary in the steam and electrical control field. With the description of products are included quick reference tables on pressure and temperatures, water heads, equivalent pressures. O. C. Keckley Co.

LUBRICATION

322—Force Feed Lubricator

Automatic force feed lubricator Model "94" described in 11-page booklet 94-C will pump against any steam or air pressure up to 1500 lb and will handle any grade of oil from the lightest mineral to the heaviest cylinder stock. Manzel Div. of Frontier Industries.

323—Non-Fluid Oil

This instruction bulletin explains the uses and advantages of Non-Fluid Oil. According to this booklet, it cannot clog fittings, it lubricates until entirely consumed, and will not separate under pressure. A free testing sample of the oil will be sent with the literature. New York & New Jersey Lubricant Co.

325—Oil Filters

Eight-page bulletin F-132 describes in detail construction and operation of hydraulic systems with special emphasis on contamination of hydraulic fluids from various causes, and demonstrates how the correct filtration system eliminates such contamination. Diagram drawings illustrate methods of installing Hilco hydraulic oil filters on various types of circuits. The Hilliard Corp.

PIPING, VALVES, & SPECIALTIES

330—High and Low Pressure Valves

Catalog 10 describes List 900 and 990 valves. The 900 is for a pressure range of 200 lb at 100 F to 380 lb at 1000 F. The 990 is for higher pressures. Chapman Valve Manufacturing Co.

331—Pump Valves

Pump valves and graphite packings are described in 24-page brochure SC-510. Types, details of construction, design features, applications, how to order, and dimensions are given. Sims Pump Valve Co., Inc.

Torque Wrenches

Both inch-pound and foot-pound torquers are described in this complete 68-page catalog. Types included are for a wide range of drive sizes with plain or ratchet head. **Please send requests directly to Proto Tool Co., Dept. IP, 22762 Santa Fe Ave., Los Angeles 54, Calif., with 10c.**

334—Air Traps

Methods of selecting and installing air traps for automatic drainage of water from compressed air intercoolers, aftercoolers, receivers, separators, and drip points are explained in four-page bulletin 2022. Armstrong Machine Works.

336—Expansion Joints

Relief of stresses in piping installations is possible with use of Rubber Expansion Joints, according to four-page folder 259-W. Round, square, rectangular, oval, taper, and special shapes are described. La-Favorite Rubber Mfg. Co.

337—Steam Traps and Specialties

Catalog 68G, 31 pages, describes and illustrates steam traps, strainers, regulating and reducing valves, separators, and vacuum and lifting traps. Strong, Carlisle & Hammond Company.

338—Valves

Needle, globe, plug, check, relief, and special valves are described in 44-page catalog 352A. Units listed are made of various metals, and are suitable for instrumentation, processing industries, hydraulic systems. Republic Manufacturing Co.

POWER TRANSMISSION — MECHANICAL

339—Belt Conveyor Design

Engineering data required to design a belt conveyor for any application are presented in 86-page catalog 852. The booklet, published to serve as a handbook on conveyor design, states that many problems can be answered by using a standardized unit. The Jeffrey Mfg. Co.

340—Adjustable Speed Equipment

Principle of operation and use of Dynamatic Eddy-Current adjustable speed equipment is described in 16-page bulletin GB-2. Typical torque and load curves are given. Dynamatic Div., Eaton Mfg. Corp.

341—Poly-V Drive

Design characteristics of the Poly-V drive, a single, endless belt with molded length-wise ribs, are explained in eight-page folder 6638. Manhattan-Rubber Div., Raybestos-Manhattan.

PUMPS

347—Packings

Darcova Pumcups, which permit equipment to be operated at reduced speeds, are described in two bulletins: No. 4502 on Pumcups for air or hydraulic mechanisms; and 4401 on units for reciprocating pumps. Darling Valve & Mfg. Co.

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- LONGER LIFE through extra wide bronze seats that resist pitting and corrosion
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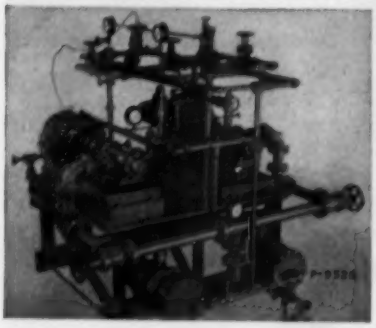

P-952-A—Steam Turbine and Electric Motor drive gives flexibility in this compact Model P-E52H size No. 25 unit.

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FUEL OIL PUMPING AND HEATING UNITS

NATIONAL AIROIL Fuel Oil Pumping and Heating Units are specially designed to prepare, for combustion, all grades of fuel oil including No. 6 or Bunker "C" Oil and residuums. They will draw fuel oil from above ground or underground tanks, preheat it to proper constant temperature and deliver it to Oil Burners at an even pressure, best suited for the burners. Our Fuel Oil Pumping and Heating Units are the result of years of experience. They come completely equipped ready for steam, exhaust, condensate, oil suction, oil return, and electrical connections. All valves, regulators, etc., are readily accessible. The piping arrangement is easily understood. These compact, space-saving units are available in a range of sizes and models in both Medium and High Pressure types. For complete details, write for our Bulletin 4C—very interesting and informative.

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bulletins

—Starts on page 78

349—Suction Pumps

Centrifugal Pumps — Four-page bulletin 512-A gives complete information on the Type SB horizontally split case, double balanced suction pumps including dimensional drawings. Weinman Pump Mfg. Co.

353—Sump Pumps

Automatic sump pumps, standard series, explosion-proof, totally enclosed, and submersible type are described in four-page folder 5362. Selection information includes tables of capacities, water consumption, and dimensions. Penberthy Injector Co., Div. of Buffalo-Eclipse Corp.

354—Sewage and Sump Pumps

Comprehensive, eight-page bulletin 325-A32 is for engineers, architects, and contractors who specify sewage and sump pumps. It describes in detail three types of pumps: The NKS Vertical Wet Pit Single or Duplex; the NKV Vertical Dry Pit; and the NKH Horizontal. American Marsh Pumps, Inc.

REFRACTORIES & INSULATION

355—Refractories

Charts which show at a glance the properties of refractory castables, plastics and mortars are featured in 20-page catalog R-22. Important information including recommendations for each is presented. Babcock & Wilcox Co., Refractories Div.

358—Castable Refractory

Bulletin 35 describes the service whereby this company provides engineering materials, and erection service for vessel lining or heat enclosure jobs. Bigelow-Liptak Corp.

360—Refractory Concrete

"Refractory Concrete Manual," 16-pages, covers basic information on recommended practice for mixing and placing refractory concrete. Lumnite Div., Universal Atlas Cement Co.

TURBINES & STEAM ENGINES

361—Low-Cost Power

If you use steam for heating, cooking, or processing, you can get power at almost no cost with the use of Wing steam turbine according to bulletin SW-1a. Construction of these units gives an almost infinite range of speeds, easy control by throttling. L. J. Wing Mfg. Co.

362—Steam Turbines

Fully-illustrated 24-page bulletin 1961 emphasizes the flexibility of design of the Type-S turbine which is said to make possible selection of the proper number of stages, governor, and controls to give maximum efficiency. Worthington Corp.

363—Multi-Stage Turbines

Smaller framed, multi-stage turbines are featured in six-page bulletin. Overspeed governor, governor valves, blades, diaphragms, and many other design features are discussed. Terry Steam Turbine Co.

365—Steam Turbine Selection

Full details of this company's steam turbine are given in bulletin 135. Drawings and installation photographs point out the special features. How to save operating and maintenance costs by buying the right size for individual needs is explained. Coppus Engineering Corp.

WASTE DISPOSAL

366—Waste Treatment

How this company has solved waste treatment problems for such industries as electro-plating, refinery, gas, and metal finishing is treated in detail in six-page booklet 70-B. A handy bibliography serves as a reference for more information. Infilco, Inc.

WATER TREATMENT

368—Water Analysis

Published by a company engaged exclusively in the solution of industrial water conditioning problems, this 14-page brochure contains brief descriptions of testing and control equipment necessary for the more common water analyses. W. H. & L. D. Betz.

369—Water Purification

"Boiler Feedwater Treatment," 19-page bulletin BFT-1, covers Inversand zeolite softeners, color process chemical softeners, and demineralizing units, including silica removal by ion-exchange by means of chemical formulas and flow diagrams. Hungerford & Terry, Inc.

370—Ion Exchangers

Strongly basic anion exchanger is presented in bulletin 57 which includes complete data on physical characteristics, exchange capacity and regeneration technique. National Aluminate Corp.

371—Water Conditioning

The entire line of water conditioning equipment and specialties is briefly covered in four-page bulletin 6210. Where more detailed booklets are available each description carries the identification number of such booklet. Cochrane Corp.

372—Filters and Strainers

Quick coupling, non short-circuiting fluid filters and strainers for water, chemicals, and oils can solve many maintenance problems for you according to four-page folder 654-MC. Ronningen Mfg. Co.

373—Boiler Water Treatment

Difficulties caused through industrial water contamination are outlined in a 12-page catalog. Recommended water conditioning treatments for scale, sludge, corrosion, carryover and other boiler conditions, and efficient control methods are described. E. F. Drew & Co., Inc.

375—Boiler Water Foam

Laboratory pictures in this four-page folder show how Concentrol controls boiler water foam. Examples of its use in various industries are given along with an explanation of foaming. Bird-Archer Co.

377—Ground Water

Methods of abstracting water from the ground or by infiltration through permeable beds of rivers or other bodies of water are discussed in 20-page bulletin. Performance charts for this company's collector are supplemented with cross-sectional drawings and cut aways. Ranney Method Water Supplies, Inc.

378—Water Treatment

"Water Conditioning — One Source for Every Need," 19-page bulletin 611B, presents the wide range of products available from this company and explains how each type solves particular problems. Elgin Refinite Div., Elgin Softener Corp.

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silence any intake or exhaust noise

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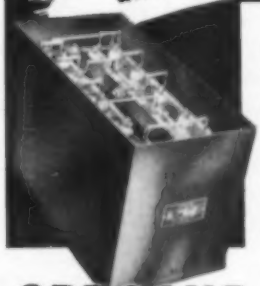

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Assembly No. 618

You get more inches of visibility within centers available . . . and no blind spots with the New Jerguson Steam Gages with the horizontal expansion loop. The special new compact valve, with a *horizontal* loop that keeps the strain off the gage assembly under varying conditions of expansion and contraction, gives you maximum gage room within the centers.

The special offset single piece gage chamber design with staggered glasses and covers gives you continous visibility of the water level *with no blind spots* between gage sections.

The gage can be turned at any angle, yet there are no stuffing boxes between gage and valves. The ingenius design of the assembly includes a bracket so the gage will always stay in vertical position. The OS&Y valves have renewable seats and are standard with quick closing stem for chain operation, as shown, or available with plain closing stems and chain wheels.

Made in three designs of single piece chamber: for one, two, or three section glass for any W.S.P. Any Jerguson standard gage may be supplied with stems and flanges for use with this expansion loop valve.

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names make news

. . . personalities from industry and power

Belco Industrial Equipment Div., Inc., names **Sol Ruden** as assistant general manager and director of purchasing, **Herbert I. Wortreich** as technical sales manager, and **Charles Eshrich, Donald Hoatson, Ernest Proesch, John Jaeger,** and **Albert Ullrich** to project directors.

Philadelphia Pump and Machinery Co., Inc., announces that, as of Dec. 1, 1954, it has become a subsidiary of **American Meter Co.** The same executive staff will remain in office; **Joseph A. Eagan,** president; **William G. Hamilton, Jr.,** vice president; **William Ashby,** secretary and treasurer.

Metropolitan Refining Co., Inc. has appointed **Frederick S. Hodgdon** as associate chief engineer on problems pertaining to water treatment in air conditioning and allied equipment.

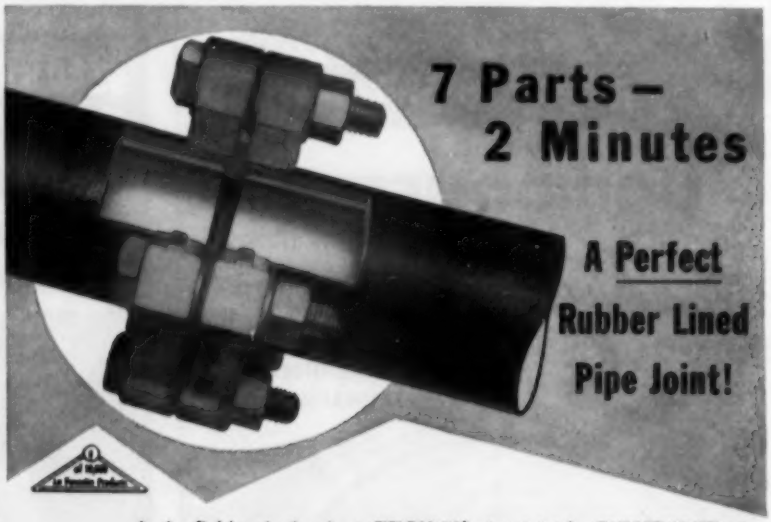
D. J. Murray Manufacturing Co. names **S. D. Payzer** as vice president in charge of engineering, a newly created position.

Westinghouse Electric Corp. announces retirement of **Dr. Samuel G. Hibben,** director of applied lighting for the Lamp Div.

Link-Belt Co.—**Chester E. Ault** is appointed assistant sales manager for the plant at 300 West Pershing Rd., Chicago. He succeeds **Andrew K. Kolar,** who is named purchasing agent for the same plant.

Ault **Rearick**

Babcock & Wilcox Co. has purchased assets and business of Globe Steel Tubes Co., of Milwaukee, Wis. **Glen H. Rearick,** formerly in charge of the



In the field or in the shop, FIELDLINK* pipe joint for RUBBER LINED pipe radically reduces the cost of rubber lined pipe installations. Repairs to pipe lines quickly made by using FIELDLINK in place of standard pipe flanges on lined piping.

Easily installed by field or shop men—without piping layouts or engineering assistance.

For Complete Details, Send for Bulletin 2958

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Alliance, Ohio plant of the Tubular Products Div., is in charge of the Milwaukee plant.

Federal Pacific Electric Co. has appointed **Howard D. Tindall** as manager of the Transformer Div. He will manage Gardner Electric Manufacturing Co., San Francisco, a wholly-owned subsidiary of Federal Pacific.

Tindall **Ramsey**

Worthington Corp. has elected **Hobart C. Ramsey** chairman of the board, succeeding **Howard Bruce** who is elected chairman of the executive committee. **Edwin J. Schwanhausser** becomes president and **Clarence E. Searle** retires as vice-chairman of the board but continues as a director. **Walther H. Feldmann** becomes executive vp, to succeed Schwanhausser.

Darling Valve & Manufacturing Co. —New sales offices have been established at 30 N. LaSalle St., Chicago. Heading activities from this office will be **B. E. Engstrom,** midwest sales manager for Darling.

Beckman Instruments Inc.—**Thomas J. Kehoe** is appointed application engineer. He will be concerned principally with industrial pH in waste and process control fields and flow colorimetry.

Emsco Manufacturing Co. has purchased most of the assets of **Johnston Pump Co.,** effective January 31, 1955.

Chapman Valve Manufacturing Co. has elected **Ernest Cochran** to the office of president and general manager of the company, succeeding the late **John J. Duggan. Harold G. Dickey,** president of Moore Drop Forging Co., was elected to the board of directors.

Patterson-Kelley Co., Inc. has appointed the Frank Hockett Co. as exclusive representative in the state of Arizona for P-K equipment.

Marietta Concrete Corp. — **Henning de Bang** is appointed chief engineer for the Design Development and Engineering Div.

International Nickel Co., Inc. — **James B. Morey** is appointed in charge of the Cincinnati, Ohio technical field section of the Development and Research Div. **William S. Mounce** joins the division's staff in New York City as a member of the construction alloy steel section.

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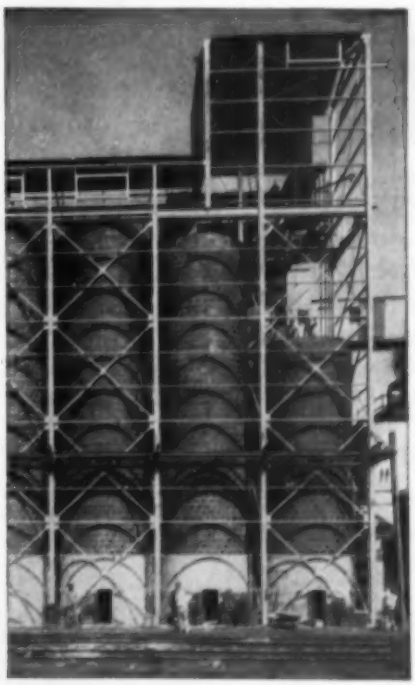

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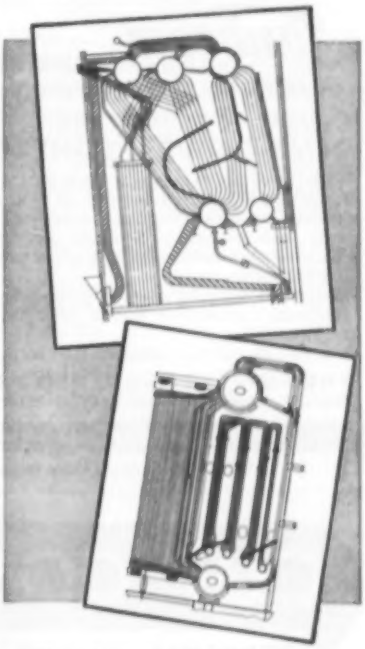

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Bulletin 330 Describes Controls for Metal Finishing

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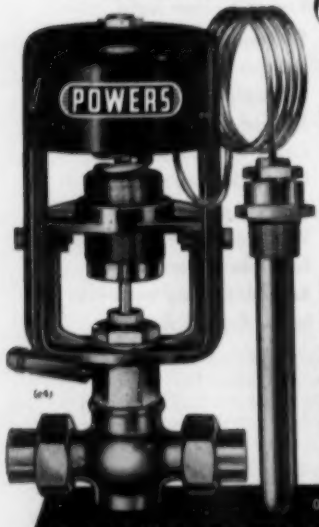

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Over 60 Years of Automatic Temperature and Humidity Control

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ideas in action

—Starts on page 66

actuator. In operation, the desired generator frequency is set on the control panel. The control panel then checks the operation of the generator and supplies a signal to the hydromechanical throttle actuator which increases or decreases the throttle setting of the prime mover as required. The entire operation takes place in a fraction of a second.

Plant Engineers Show Increasing Interest in Voltage Control

Increasingly wide application of dry-type induction regulators is following in the wake of demands for better regulation. In industry, there is more and more voltage-sensitive equipment — such as electronic devices, critically controlled electric heating units, and special lighting. This has developed a demand for well-regulated industrial voltages to an extent unheard of before World War II.

Reflecting the serious view taken of voltage regulation by users themselves, a recent survey by General Electric reveals that the largest category of buyers of dry-type induction regulators comprises the users themselves — in contrast to contractors and original-equipment manufacturers. Analyzing their figures on another basis, it was found that industrial plants bought 3½ times more regulators than the next category. Plant engineers and their staff people were found to be recommending almost half of the regulators bought for their plants. All of this again points up the fact that the plant engineer is showing increasingly active concern for his plant's voltage problems.

Materials Handling Seminar Will Concentrate on Practical Problems

Companies suffering from materials handling headaches and consequent high handling costs are invited to send a representative to the Second Annual Materials Handling Training Conference to be held June 19-July 2 at Lake Placid, N. Y.

Emphasis will be on solving actual problems which industrial companies meet in their day-to-day operations. The aim of the Conference is to provide a practical, how-to-do-it training program for company executives on a middle management or staff level and should provide a practical and efficient way to train a materials handling engineer, or to bring a firm up-to-date on handling equipment and methods.

The two-week, 90 hour study course will encompass all phases of materials handling and storage, including unit loads, bulk materials, and parts-in-process. More than 200 kinds of materials handling equipment—industrial trucks, conveyors, and overhead handling systems — will be discussed.

Enrollment fee for the course is $850 and includes all costs including two weeks living expense. A $100 deposit is required with each enrollment.

Eighteen of the Nation's materials handling experts have accepted invitations to teach at this year's Conference. Included are: O. S. Carliss, director of engineer-

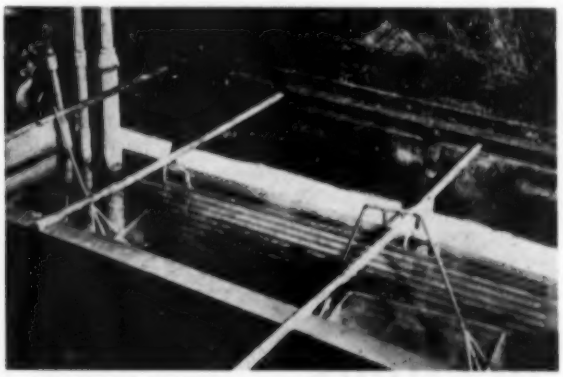
ing, Yale & Towne Mfg. Co.; Jervis C. Webb, president of Jervis B. Webb Co.; Harry Keller, chief engineer of Lamson Conveyor Co.; Neil Drake, senior partner of Drake, Startzman, Sheahan and Barclay; A. T. Gaudreau, co-author of *Plant Layout;* and A. Sinden, chief engineer of Stephens-Adamson Co.

For further information write director of the Conference, James R. Bright, c/o Harvard Business School, Boston 63, Mass.

Use of Heat Transfer Unit Speeds Up Batch Scheduling

In the anodizing department of Jack & Heintz, Inc., the solution in the anodizing tanks was cooled by pumping it through pipes immersed in a separate tank of cold, running water. Temperature control was difficult, and extra floor space and pumping equipment were needed.

To speed up the cooling process and thus increase production, a heat transfer unit, known as Platecoil, was



Unit controls temperature of electrolytic solution.

installed. Developed by Tranter Manufacturing Inc., it consists of two embossed sheets of stainless steel welded together to form channels through which heating or cooling media flow. At J&H, the Platecoil is immersed in the electrolytic solution, drawing off heat created in the anodizing process. Temperature of the solution can now be closely controlled and floor space is saved. Since the extra tank is no longer necessary.

Metallizing Increases Pump Rod Service Life

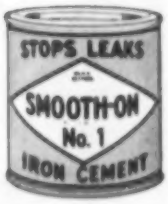
Operating conditions for rods in a steam pump used to pump crude oil "bottoms" at a large oil company in Pennsylvania are unusually severe: the "bottoms" contain grit, sand, dirt, and other abrasive material. When the pump was first put in service, the original cold-drawn steel rod lasted 48 hr. The replacement, a hardened steel rod, did little better.

Metallizing the rod with stainless steel increased rod life to four weeks in 24-hr-a-day service. Total life was actually twelve weeks since the shaft could be metallized three times before it had to be scrapped because of limitations of packing ring adjustment.

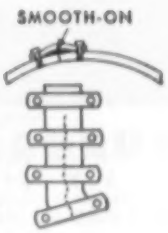
Although this system reduced rod replacement costs, the pump was still out of service once a month for rod re-metallizing. A local machine shop that does contract

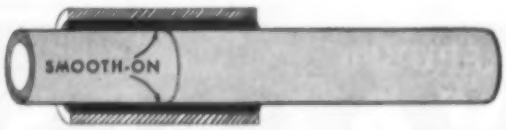
QUICK, LOW COST EMERGENCY Repairs

When you just *have* to get a boiler, or machine or plumbing system back in working condition fast, Smooth-On Iron Cement saves the day . . . and saves you many dollars, too. It makes the repair quickly. Tides you over until the permanent job can be done.

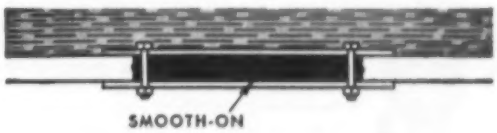


Reinforced Crack Repairs in boilers, water tanks, etc., can be made with Smooth-On No. 1 Iron Cement, as shown. Smooth-On is forced into the crack and a patch plate is then applied over the area with straps held in place by machine screws. As Smooth-On hardens it expands against the patch, making a tight, durable seal.





Emergency Pipe Joint. The same expansion principle applies here. Put the pipe ends into a section sawed from a larger pipe and pack tightly with Smooth-On.



Broken Parts. A broken casting can be repaired temporarily, as illustrated. You make a Smooth-On "sandwich" by bolting on a patch plate at top and bottom.

These are just a few of the many emergency repairs possible with Smooth-On. Better keep a can on hand! Others are described in the *free* Smooth-On Repair Handbook. Ask your supply house for a copy or write us.

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Manufacturers also of high quality low and hy-pressure check valves, relief, 2, 3, and 4-way plug valves, and special valves to specifications.

Write for complete catalog and name of nearest distributor.

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ideas in action

—Starts on page 66

metallizing applied Metco-Weld H, a product of Metallizing Engineering Co., Inc., to one rod and molybdenum to a second. The two rods were placed in service on the duplex pump at the same time.

After nine weeks, both rods were still in 24-hr-a-day service. The rod with Metco-Weld H showed some wear, but the molybdenum rod was still in good condition.

Your Brazing Alloy Scrap May Be Valuable

Using a metal-scrap refining service maintained by Handy & Harman Co., of New York City, a large manufacturer of refrigeration and air conditioning compressors is converting scrap brazing alloy to cash.

This firm, which makes all tubing joints by low temperature brazing, provides operators with scrap boxes for saving discarded ends of brazing alloy wire, and periodically scrapes the surface and supports of the conveyor and the floor in the work area.

Handy & Harman pays the cash value of the silver (or other precious or semi-precious metals) recovered, less a fee for refining. The cash value may amount to a sizeable sum since each ounce of brazing alloy contains up to ½ oz of silver, worth at today's prices about 80¢ per oz.

meetings

. . . and exhibitions

March 7-11	National Association of Corrosion Engineers (Annual Convention)	Palmer House Chicago, Ill.
March 14-18	American Society of Tool Engineers (Western Industrial Exposition)	Shrine Auditorium Los Angeles, Calif.
March 20-23	American Institute of Chemical Engineers (Spring Meeting)	Kentucky Hotel Louisville, Ky.
March 28-29	American Institute of Electrical Engineers (Materials Handling Conf.)	Hotel Cleveland Cleveland, Ohio
March 28 April 1	American Society for Metals (Western Metal Expos.)	Pan Pacific Auditorium Los Angeles, Calif.
April 18-21	American Society of Mechanical Engineers (Spring Meeting)	Lord Baltimore Hotel Baltimore, Md.
May 1-4	American Institute of Chemical Engineers (National Meeting)	Shamrock Hotel Houston, Texas
May 16-20	National Materials Handling Exposition	Int'l. Amphitheater Chicago, Ill.

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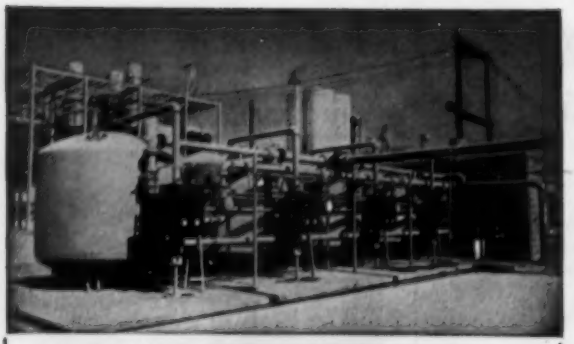

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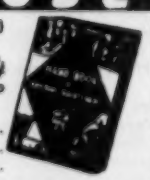

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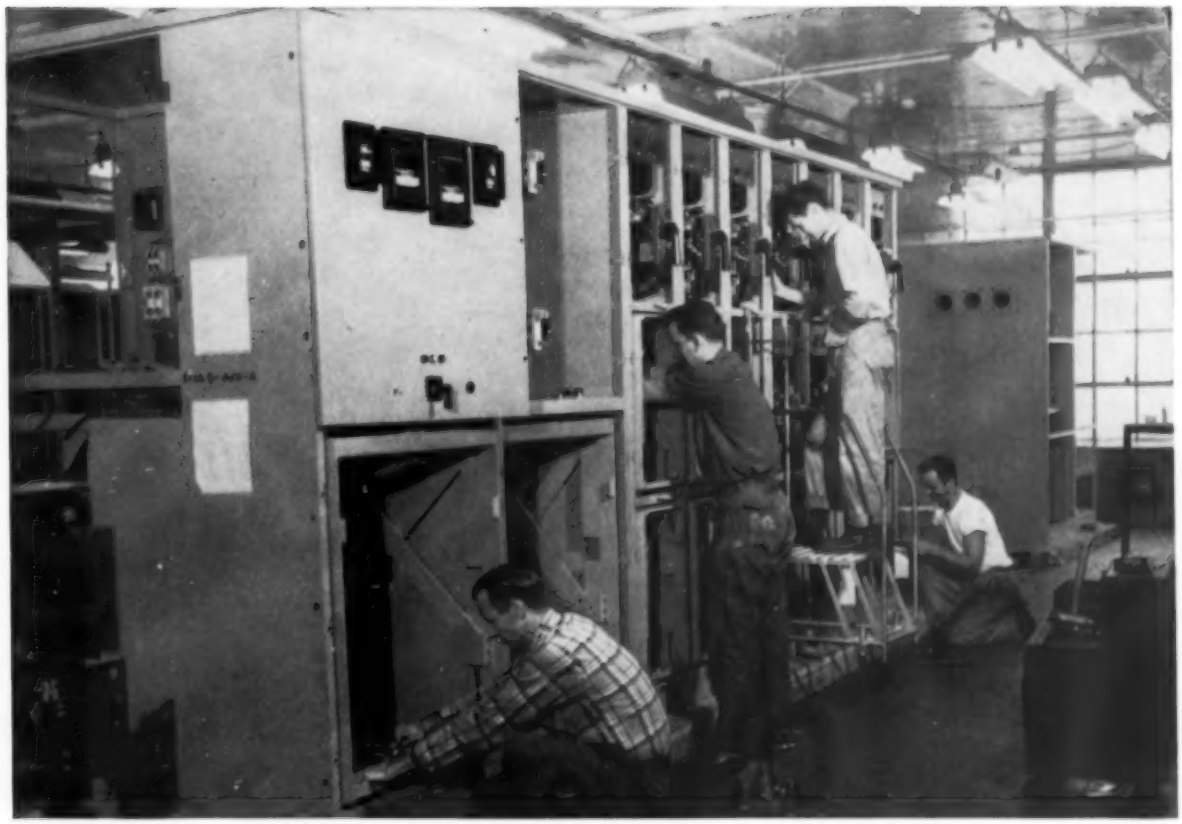

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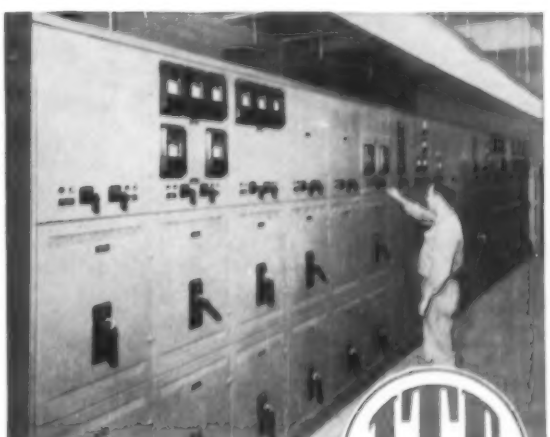

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